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AGRICULTURAL RESEARCH INSTITUTE
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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verò eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.
J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

CONTENTS OF VOL. VIII.

[NINTH SERIES.]

NUMBER 43.

Page

I. Notes on some *Noctuidæ* in the Joicey Collection, with Descriptions of new Species. By Miss A. E. Prout, F.E.S. (Plates I.–VII.) 1

II. Odonata collected in New Caledonia by the late Mr. Paul D. Montague. By Herbert Campion. (Plates VIII. & IX.) 33

III. The Old-World Species of *Eriocera* in the British Museum Collection (Diptera, *Tipulidæ*). By F. W. Edwards. (Plate X. figs. 1–12.) 67

IV. New and little-known *Tipulidæ*, chiefly from Formosa.—Part II. By F. W. Edwards. (Plate X. figs. 13–19.) 99

V. Two Examples of Abnormal Antennæ in the Crustacea Amphipoda. By Chas. Chilton, M.A., D.Sc., M.B., C.M., LL.D., C.M.Z.S., F.L.S., Professor of Biology, Canterbury College, New Zealand 116

VI. The Prey of the Yellow Dung-Fly, *Scatophaga stercoraria*, L. By Major E. E. Austen, D.S.O. 118

VII. The "Cirripede" *Plumulites* in the Middle Ordovician Rocks of Esthonia. By Thomas H. Withers, F.G.S. 123

VIII. A new Bank-Vole from Esthonia. By Martin A. C. Hinton 128

IX. The Klipspringers of Rhodesia, Angola, and Northern Nigeria. By Martin A. C. Hinton 129

Page

X. The Geographical Races of *Herpestes brachyurus*. By Oldfield Thomas 134

XI. A new Genus of Opossum from Southern Patagonia. By Oldfield Thomas 136

XII. A new Bat of the Genus *Promops* from Peru. By Oldfield Thomas 139

XIII. On Spiny Rats of the *Proechimys* Group from South-eastern Brazil. By Oldfield Thomas 140

Proceedings of the Geological Society 143

NUMBER 44.

XIV. On Twelve new Species of *Curculionidæ* from South Africa. By Guy A. K. Marshall, D.Sc., C.M.G. 145

XV. New or little-known *Tipulidæ* (Diptera).—V. Ethiopian Species. By Charles P. Alexander, Ph.D., Urbana, Illinois, U.S.A. 161

XVI. Notes on the *Asilinæ* of the South African and Oriental Regions. By Gertrude Ricardo 175

XVII. On some Additional Species of *Laius*, Guérin, from the Malayan Region [Coleoptera]. By G. C. Champion, F.Z.S. 193

XVIII. Two new Species of *Lycænidæ* from Madagascar. By Percy I. Lathy, F.E.S. 208

XIX. On Two new Races of *Oryx*. By Lord Rothschild, F.R.S. 209

XX. A new Neotreme Brachiopod from California. By S. Stillman Berry, Redlands, California. (Plate XI.) 210

XXI. The "Huron" of the Argentine. By Oldfield Thomas. 212

XXII. On Mammals from the Province of San Juan, Western Argentina. By Oldfield Thomas 214

XXIII. Two new Argentine Forms of Skunk. By Oldfield Thomas 221

Proceedings of the Geological Society 223

NUMBER 45.

Page

XXIV. Exotic *Muscaridæ* (Diptera).—III. By J. R. MALLOCH, Urbana, Ill., U.S.A. 225

XXV. Some Dragonflies and their Prey.—II. With Remarks on the Identity of the Species of *Orthetrum* involved. By HERBERT CAMPION 240

XXVI. Diagnoses of some Lichens. By Prof. Dr. C. MERESCHKOVSKY 246

XXVII. Notes from the Gatty Marine Laboratory, St. Andrews. —No. XLIII. By Prof. M'INTOSH, M.D., LL.D., D.Sc., F.R.S., &c. 290

XXVIII. New or little-known *Tipulidæ* (Diptera).—VI. Ethiopian Species. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Urbana, Illinois, U.S.A. 309

XXIX. On the Cœlacanth Fish. By D. M. S. WATSON, University College, London 320

XXX. On the Genus *Lasiodora*, C. Koch. By MELLO-LEITÃO, M.D., Fellow of the Brazilian Society of Sciences 337

XXXI. Notes on some Japanese Cephalopods.—A Review of Sasaki's 'Albatross' Report. By S. STILLMAN BERRY, Redlands, California 351

XXXII. Further Notes on various South-African Species of *Melyris*, Fabr. [Coleoptera]. By G. C. CHAMPION 353

XXXIII. New *Cryptotis*, *Thomasomys*, and *Oryzomys* from Colombia. By OLDFIELD THOMAS 354

XXXIV. New *Pseudochirus* and *Phascogale* from N.W. New Guinea. By OLDFIELD THOMAS 357

XXXV. Descriptions and Records of Bees.—XCI. By T. D. A. COCKERELL, University of Colorado 359

NUMBER 46.

XXXVI. Records and Descriptions of South African Grasshoppers of the Groups *Arcypteræ* and *Scyllinæ*. By B. P. UVAROV, F.E.S., Assistant Entomologist, Imperial Bureau of Entomology 369

XXXVII. Brief Descriptions of new Thysanoptera.—XII. By RICHARD S. BAGNALL, F.R.S.E., F.L.S. 393

Page

XXXVIII. Note on a Freshwater Sponge from New Zealand. By R. KIRKPATRICK 400

XXXIX. On the Anatomy and Affinities of *Hypsobia nosophora*. By G. C. ROBSON, B.A. 401

XL. Exotic *Muscaridæ* (Diptera).—IV. By J. R. MALLOCH, Urbana, Ill., U.S.A. 414

XLI. Notes on Australasian Rats, with a Selection of Lectotypes of Australasian *Muridæ*. By OLDFIELD THOMAS 425

XLII. On Specimens of *Cephalodiscus densus* dredged by the 'Challenger' in 1874 at Kerguelen Island. By W. G. RIDEWOOD. (Plate XII.) 433

XLIII. The Jerboa of Muscat. By OLDFIELD THOMAS 440

XLIV. A new Short-tailed Opossum from Brazil. By OLDFIELD THOMAS 441

XLV. A new Cotton-tail (*Sylvilagus*) from Colombia. By OLDFIELD THOMAS 442

XLVI. On a new Willow-Titmouse from Northern Italy. By PERCY R. LOWE, M.B.O.U., F.Z.S. 443

XLVII. On new Forms of South-American Birds. By C. CHUBB, M.B.O.U., F.Z.S. 444

New Book:—The Life of Alfred Newton. By A. F. R. WOLLASTON. 447

NUMBER 47.

XLVIII. Revision of the African Species of *Hedybius*, Er., and its Allies, with an Account of their accessory ♂-characters [Coleoptera]. By G. C. CHAMPION, F.Z.S. (Plates XIII. & XIV.) 449

XLIX. On the Discovery of the missing Type Specimen of the Ascidian *Oculinaria australis*, Gray. By R. KIRKPATRICK 494

L. On the Anatomy of some new Species of *Drawida*. By C. R. NARAYANA RAO, M.A., University of Mysore, Bangalore. (Plates XV.-XVIII.) 496

LI. Notes on the Species of *Notomys*, the Australian Jerboa-rats. By OLDFIELD THOMAS 536

LII. Fossil Arthropods in the British Museum.—VII. By T. D. A. COCKERELL, University of Colorado 541

LIII. New or little-known *Tipulidæ* (Diptera).—VII. Australasian Species. By CHARLES P. ALEXANDER, Ph.D., Urbana, Illinois, U.S.A. 546

LIV. On some new small Mammals from East Africa. By P. S. KERSHAW 563

Page

LV. A new Hedgehog from the Island of Djerba, Tunis. By Oldfield Thomas 570

LVI. On some Remains of a Theropodous Dinosaur from the Lower Lias of Barrow-on-Soar. By Charles W. Andrews, D.Sc., F.R.S. (British Museum, Natural History) .... *ib.*

LVII. On the Life-history of *Dasyhelea obscura*, Winnertz (Diptera, Nematocera, *Ceratopogonidæ*), with some Remarks on the Parasites and Hereditary Bacterian Symbiont of this Midge. By D. Keilin, Sc.D., Beit Memorial Research Fellow (Quick Laboratory, University of Cambridge). (Plates XIX. & XX.) 576

LVIII. Some undescribed Rhopalocera from Mesopotamia and N.W. Persia; and other Notes. By N. D. Riley 590

NUMBER 48.

LIX. On some Dipterous Larvæ infesting the Branchial Chambers of Land-crabs. By D. Keilin, Sc.D., Beit Memorial Research Fellow (from the Quick Laboratory, University of Cambridge) 601

LX. On a further Collection of Mammals from Jujuy obtained by Sr. E. Budin. By Oldfield Thomas 608

LXI. The Masked Civets (*Paguma*) of Western China. By Oldfield Thomas 617

LXII. On Three new Australian Rats. By Oldfield Thomas . 618

LXIII. New *Hesperomys* and *Galea* from Bolivia. By Oldfield Thomas 622

LXIV. Some Emendations to their Recent Paper "On *Helicella*, Férussac." By G. K. Gude, F.Z.S., and B. B. Woodward, F.L.S. 624

LXV. Preliminary Account of supposed new Genus and Species. By the Rev. Thomas R. R. Stebbing, M.A., F.R.S. 626

LXVI. Two new Species of Slow-Loris. By Oldfield Thomas. 627

LXVII. H. Sauter's Formosan Collections: *Culicidæ*. By F. W. Edwards 629

LXVIII. The Cichlid Fishes of Lakes Albert Edward and Kivu. By C. Tate Regan, M.A., F.R.S. 632

LXIX. On a new Genus of *Coccidæ* from the Indian Region. By E. E. Green, F.Z.S., F.E.S. 639

LXX. Some new or rare British Crustacea. By Robert Gurney, M.A. 644

Editorial Note 650

Index 651

PLATES IN VOL. VIII.

Plate I.	New Noctuidæ.
II.	
III.	
IV.	
V.	
VI.	Genitalia of Noctuidæ.
VII.	
VIII.	Corduliine Dragonflies from New Caledonia.
IX.	
X.	Wings of Formosan Tipulidæ.
XI.	Crania californica, sp. n., from California.
XII.	Cephalodiscus densus, Andersson.
XIII.	African species of Illops and Hedybius.
XIV.	African species of Hedybius and Philhedonus.
XV.	Anatomy of new species of Drawida.
XVI.	
XVII.	
XVIII.	
XIX.	Dasyhelea obscura, Winnertz.
XX.	

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

"………. . per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasii, Ecl. 1.

No. 43. JULY 1921.

I.—*Notes on some* Noctuidæ *in the Joicey Collection, with Descriptions of new Species.* By Miss A. E. Prout, F.E.S.

[Plates I.-VII.]

Introductory Note.

In publishing the following notes, I wish gratefully to acknowledge my deep indebtedness to Mr. J. J. Joicey for the opportunities of study he has so kindly afforded me by entrusting to me the responsible task of working out his fine and rapidly-increasing collection of the Noctuidæ of the world. The accompanying paper is the outcome of my studies of the Joicey Collection, and the types will in all cases be found there, unless otherwise specified.

I wish, further, to acknowledge gratefully my indebtedness to Sir George F. Hampson for help and advice given me in my studies at the British Museum, and especially so for the invaluable service he has rendered to all students of the Noctuidæ by his standard work on the family, which has done so much to render the working out of this large and extremely difficult group less hard for those who come after him. If, in this and in papers I may subsequently publish, the opportunity of studying larger material or some independent light on the subject should lead me to differ from Sir G. Hampson's conclusions, I shall do so always with respectful remembrance of what I owe to his book and to his careful working out of the National Collection, without the aid of which my own work would scarcely have been possible.

I would also tender my thanks to Lord Rothschild, Professor Poulton, and Mr. Bethune-Baker for the loan of types, to Mr. W. H. Tams for assistance given me in my work at the British Museum, and especially to the Rev. C. R. N. Burrows, who in the midst of his busy and strenuous life has so kindly found time to work out the genitalia of various Noctuidæ submitted to him from the Hill Museum. The illustrations on Plates I.–VII. are photographed from drawings prepared by Mr. Burrows.

Finally, I would tender sincerest thanks to my brother, Mr. L. B. Prout, who has revised my manuscript, and who, throughout my studies, has given me help and advice as to the best methods of specialized entomological work, placing his own wide knowledge and experience freely at my service.

NOTE ON CLASSIFICATION.

In spite of Sir George Hampson's excellent work, there is evidently much still needing elucidation, both with regard to the classification and the nomenclature of the Noctuidæ; but in the following paper I have followed the system of nomenclature first published in the Cat. Lep. Phal., except in one or two instances.

In Hampson's Phytometrinæ I have used the old familiar name of Plusianæ for the subfamily and *Plusia* for the genus. For the Noctuinæ I have temporarily employed Guenée's Ophiderinæ—though the name is not a satisfactory one, as *Othreis*, Hbn., has priority over *Ophideres*, Boisd. But Noctuinæ is obviously untenable, since, as Aurivillius points out in his paper in Schwed. Kilim. Exped. (9) p. 84 (1910), Hampson's use of the name *Noctua strix* for *Thysania agrippina* is founded on a misconception, due to Linné having erroneously cited to *strix* a figure in Merian's "Insects of Surinam," and having been thereby led to consider *strix* as an American species. Linné's own description of *strix* distinctly mentions that it is "tongueless" and that the wings are "black, reticulated and clouded"; and in the later fuller description in the "Museum Ludoricæ Ulricæ" he further says "nec alas dentalus nec lingicam observo." In view of these descriptions and of the fact that Linné's type of *strix* is still in the Queen Louisa Ulrica Collection (which never possessed a specimen of *Thysunia agrippina*) it seems quite certain that Linné's *Noctua strix* was the common S. Asiatic Cossid, which was figured and described by Clerck as *strix*, L. Therefore (as Aurivillius concluded his remarks by pointing out), "anyone who is of opinion that the first species is to be considered typical would have in consequence to consider the Cossids as the true Noctuids"! The name Erebinæ (employed by Barnes and McDunnough in their 'Check-List of the N. American Lepidoptera') seems also, unfortunately, to be untenable, as Latreille appears to cite *crepuscularis*, L., as his type of *Erebus*, and *odora*, L., only as an additional species; this necessitates the transfer of the name *Erebus* to the Catocaline genus *Nyctipao* (see Cat. Lep. Phal. xiii. p. 331), *odora* becoming (according to Hampson) *Otosema odora.* It seems necessary, therefore, to select some other subfamily name, and, in the meantime, I have chosen Ophiderinæ.

My other point of difference from Sir George Hampson opens up a wider question than one of mere nomenclature. It is with regard to the classification of the subfamilies Catocalinæ and Ophiderinæ.

The Rev. C. R. N. Burrows has called my attention to the wide divergence between the genitalia of the genus *Catocala* and immediately allied genera and those of *Acanthodica*, *Erebus* (*Nyctipao*), *Speiredonia*, *Ercheia*, and others of the later Catocaline genera submitted to him, the latter all having very large coremata (entirely wanting in true *Catocala*). Mr. Burrows strongly urges that these two groups should be separated, and, in view of the very distinct early stages of *Catocala* (mentioned by American authors, who have no doubt had opportunities of comparison with the early stages of some of the exotic species of Hampson's Catocalinæ), as well as the difference of genitalia, it seems very probable that the *Catocala* group of species will ultimately be found to form a distinct subfamily, although I have not as yet been able to discover any structural point, apart from the genitalia, which will form a good key-distinction for the subfamily. I shall be grateful for any information which may help to throw light on this interesting question.

A further question arises with regard to the separation of certain apparently closely-allied species. In Cat. Lep. Phal.

xii. p. 2, Hampson mentions the fact that many of the Catocaline genera have close relatives in his Noctuinæ, suggesting a common origin between the two subfamilies; but he does not emphasize the point. In working through these two subfamilies, however, I have been so constantly struck by the close resemblance between genera in the two that I have begun to doubt whether the spinous mid-tibia can be a subfamily character at all.

With a view to elucidating this point, specimens of *Cocytodes maura*, Holl. (Pl. VI. fig. 3), *Cocytodes cærulea*, Gn. (Pl. VI. fig. 2) (Catocalinæ), and *Arcte papuensis*, Warr. (Pl. VI. fig. 1) ("Noctuinæ"), have been submitted to the Rev. C. R. N. Burrows for dissection; also specimens of *Achæa ablunaris*, Gn. (Pl. VI. fig. 4) (Catocalinæ), and *Mimophisma delunaris*, Gn. (Pl. VII. fig. 1) ("Noctuinæ"). With regard to the *Cocytodes* and *Arcte* species Mr. Burrows writes:—"3 & 4 (*C. cærulea* and *A. papuensis*, are more close than 2 (*C. maura*) to either." Of *A. ablunaris* (comparing it with *M. delunaris*) he writes, "Is a distinct species, but I think undoubtedly belongs to the same 'genus,' so far as we understand anything by the term genus. It is indeed a close 'brother,' with all the features the same, but different in form and development."

In view of these conclusions, and of the strong resemblance between many other species which are divided by Hampson's use of the spinous mid-tibia as a subfamily character, it seems not improbable that this character will ultimately have to be discarded, and some other classification of these large and very heterogeneous groups adopted in its stead, especially in view of the following points:—

(1) In some species only one or two spines seem to be present—a form intermediate between true Catocalinæ and "Noctuinæ."

(2) In other species the spines are only visible in the ♀ (though possibly concealed in the ♂).

(3) In several of the subfamilies the fore and hind tibiæ are sometimes spined, sometimes non-spined; there seems no logical reason why the mid-tibia should be of more subfamily value than fore or hind tibia—especially considering that, in the Trifids, it is the hind tibia that is taken to characterize a subfamily (the Agrotinæ), so that there is no correspondence between the two groups. It is certainly rare for the hind tibia to be spined and the mid-tibia unspined (suggesting that the natural order of development is for the spines to appear first on the mid-tibia); but this is by no means a universal rule, for there are genera both in the

Agrotinæ and the Plusianæ which have the hind tibia spined and the mid-tibia non-spined.

ERASTRIANÆ.

1. *Lophoruza rubrimacula*, sp. n. (Pl. I. fig. 1.)

♂.—24 mm.

Head and thorax above pinkish white with some brown scales intermingled (chiefly on head and tegulæ); body beneath and legs whitish; dorsum of abdomen with the basal and anal segments pinkish white, the medial segments brown, mixed with black.

Fore wing with the costal half, from apex to hind margin at nearly one-third, pinkish-white with the costa tinged with tawny brown; the rest of the wing pale tawny-brown, somewhat darker where it meets the pale shade, the termen distinctly darkened from apex to behind R^3; a tawny streak at base of wing, extending across metathorax; some brown shading in middle of cell; antemedial, medial, and postmedial lines just visible as pale, dark-outlined, outwardly oblique streaks on the costal tawny shade, the two former becoming obsolescent behind SC, the latter indistinctly continued as a punctiform dark line, excurved round cell, then incurved to inner margin at about two-thirds; a fine white subterminal line, expanding to a conspicuous white spot on R^2, behind which it is angled outward, with some proximal black dots anteriorly; a rufous proximal patch between the radials, and three ochreous spots (one proximal and two distal) between SC^5 and R^1; a row of black marginal spots and a fine dark marginal line; fringe pale tawny-brown chequered with blackish-brown.

Hind wing with the base pinkish-white, the rest of the wing pale tawny-brown, almost whitish about the subterminal area; a slight, dark, waved postmedial line; a small subterminal rufous spot behind M^1 and a large one from M^2 to near abdominal margin, with a small brown one behind it; marginal spots and line and fringe as on fore wing.

Wings beneath whitish tinged with tawny-brown, with slight curved crenulate postmedial and subterminal lines; margins as above, but less sharply marked; discal spots very slight.

♀.—26 mm. Marked as in the ♂, but with the pinkish and tawny shades both a trifle brighter.

Upper Tonkin: Muong-Khuong, Prov. Laokay, 900–1000 m., type and 1 ♀.

Nearest to *albicostalis*, Leech., from Central China, from which it differs in the darker subapical shade on fore wing, the rather larger and darker subtornal spot behind M^2 on the hind wing, the rather darker shade on the costa of fore wing, and, especially, in the brown streak across metathorax and base of fore wing (which is not present in any specimen of *albicostalis* that I have seen). Possibly only a subspecies.

2. *Lithacodia picatina*, sp. n. (Pl. I. fig. 2.)

♂.—22 mm.

This species has hitherto been mixed with *picata*, Btlr., in the British Museum and evidently also at Tring, for it is figured in Seitz (Macro-Lep. vol. xi. pl. xxvi. *a*) as *picata*. The two species are quite clearly distinguishable by the triangular dark patch on base of costa in *picata* being replaced in *picatina* by a golden-brown streak along the costa; by the antemedial line being only slightly crenulate in *picatina*, not angled at the folds as in *picata*; by the absence in *picatina* of the postmedial dark point on costa and the black point at upper angle of cell, the black spot at lower angle of cell being also reduced in size; by the subterminal line being almost obsolete in *picatina*; and (perhaps the most constant distinction of all) by the shape of the white mark on distal margin, from SC^5 to R^1, which forms a narrow patch in *picatina*, quite separate from the other white markings, but in *picata* is less sharply marked and is always connected by a white bar between R^1 and R^2 with the white postmedial and tornal areas. Fringe of fore wing in *picatina* whitish-brown, tipped with grey. In other respects exactly agrees with Hampson's description of *picata*, Cat. Lep. Phal. x. p. 503.

Khasia Hills, Assam (*Nissary*), type and 5 other ♂♂.

In British Museum from Sikkim and one specimen from Sabathu.

EUTELIINÆ.

3. *Eutelia regalis*, sp. n. (Pl. I. fig. 3.)

♂.—27 mm.

This species belongs to the section of the genus called *Eleale* (Sect. 1, B, *c*, of Hampson), its nearest allies being *fulvipicta*, Hmpson., and *plusioides*, Wlk.

Head and thorax above bright red-orange, the tegulæ a little darker; palpus, pectus, and legs ochreous-brown, the tarsi ringed with white; abdomen ochreous-brown, with the dorsal crests red-orange.

Fore wing with the basal third and a large postmedial costal patch ochreous, thickly irrorated with red-orange; the rest of the wing white, closely irrorated with grey-violet; lines indistinct; antemedial, medial, and postmedial white spots on costa; indistinct, blackish, sinuous antemedial, medial, and postmedial lines, all angled outward before middle, then somewhat incurved to hind margin; an indistinct maculate subterminal line, following the curve of the postmedial; a white streak from costa near apex to termen about R^1, and a curved white streak from M^1 near termen to tornus, the two being connected by slight white spots; fringe grey-brown.

Hind wing pale ochreous, the distal half grey-violet narrowing to apex and tornus; a white dash from M^1 to termen near tornus, and a white spot on abdominal margin just proximally to tornus; fringe grey-violet with a fine pale line at base.

Underside of fore wing violet-grey, posteriorly pale ochreous; slight dark cell-spot and double curved postmedial line; the white terminal line of the upper surface showing near apex and on hind-marginal half of wing. Hind wing as above, with the addition of a dark cell-spot, with some violet suffusion above it, and a slight postmedial line.

Amboina, type only.

Can be easily distinguished from both *fulvipicta* and *plusioides* by the deeper tone of colour, the broader border to the hind wing, the absence of the diffused black streak in the basal half of cell, etc.

STICTOPTERINÆ.

4. *Stictoptera plumbeotincta*, sp. n. (Pl. I. fig. 4.)

♀.—36 mm.

Head and thorax leaden-violet, mixed with some ochreous scales; palpus and antennal shaft ochreous shaded with leaden-violet; dorsum of abdomen grey-brown, with the basal crests a little redder; body beneath pale ochreous; legs pale ochreous shaded with violet.

Fore wing pale ochreous, largely suffused with leaden-violet, especially on the basal area to medial line and on apical area, leaving a subtriangular patch of the ground-colour on distal part of hind margin; sub-basal and antemedial lines almost obsolete, the latter purplish-grey, undulating, starting close to medial line, then incurved, strongly excurved before hind margin; medial line black, with some proximal dark shading in and behind cell, oblique and slightly crenulate from two-fifths costa to two-thirds hind margin; reniform leaden-grey, with faint pale outline, narrowing towards costa; an indistinct fine crenulate dark line nearly parallel with the median line, but approaching it at hind margin; postmedial line a grey dash on costa, then a row of indigo spots between the veins, angled out on SC^6, excurved to fold, and angled out on SM^2; an undulating pale subterminal line from costa near apex to tornus, with three black proximal darts behind costa, SC^5, and SC^4, the last the largest, proximally darkened from M^1 to tornus; a row of pale-edged black marginal spots between the veins; fringe grey, with pale streaks at the veins.

Hind wing with basal area hyaline, smoky brown along hind margin, with the distal two-fifths and a lunule on DC^2 and DC^3 dark grey; fringe pale brown, shaded with grey between the veins.

Underside of fore wing smoky-grey, with some peacock-green reflections on basal half of hind-marginal area and a pale patch between the origin of M^1 and M^2; five or six pale spots on apical half of costa, with black spots between them; slight, dark medial, postmedial, and subterminal lines, as above. Hind wing as above, with the costal area slightly smoky and an oblique black streak from costa to the lunule on discocellulars.

Rossel Is.; Mt. Rossel, 2100 ft., Dec. 1915 (*W. F. Eichhorn*), type and another ♀.

SARROTHRIPINÆ.

5. *Blenina brevicosta*, sp. n. (Pl. I. fig. 5.)

♀.—38 mm.

Head and thorax white, thickly irrorated with green above and with a few brown scales; patagia with some black scales near middle. Palpus and legs white, marked with brown and black. Abdomen yellow above and beneath, with the anus browner; the crests greenish.

Fore wing white, irrorated with green scales on the basal half of wing and the postmedial area, with violet-brown on the medial area—where it forms a sort of band—and on the apical half of distal area; a few brown scales on the costal half of subbasal area and some yellow hair at base of hind margin. Subbasal line slight, blackish, curved to about median nervure; a black antemedial half-line from costa, angled outward to the subcostal and again above median;

a black spot obliquely beyond it, near hind margin; median line obliquely sinuous from two-fifths costa to half hind margin, angled outward behind M^2, a small black spot distally to it in cell and an upright blackish streak in place of the reniform; postmedial line obliquely sinuous from half costa to close to tornus, indistinct, upright at costa, strongly angled outward at R^1 and before hind margin and inward at R^2 behind M^1; subterminal line strongly dentate, nearly parallel with margin to about R^3, upon which and on M^1 it is angled out to nearer the distal margin, which it joins at SM^2; broad terminal black spots on the veins; fringe white, with black streaks between the veins and slight brown tips.

Hind wing yellow, coloured about as in *B. donans*, Wlk., but with the dark border extended along costa, ending close to M^2, shading gradually into the ground-colour and extending across the fringe; tornal one-third of fringe yellow; veins slightly darkened.

Underside of fore wing brown; costa from near base white with some brown marks on it, the white broadening to a patch from about half to three-quarters along costa; fringe white chequered with blackish, as above. Hind wing as above, but with a reddish tinge on costal area.

Sierra Leone, type only.

This specimen appears to belong to the genus *Blenina*, but the fore wing is a trifle narrowed at the apical part of costa, the hind wing unusually narrow and almost without the marginal indentation behind M^1 which is so characteristic of the majority of *Blenina* species. The origin of M^2 on the hind wing is removed further from M^1 than in any other *Blenina* species known to me, unless it be *B. quadripuncta*, Hmpsn. (type in Coll. Joicey), the neuration of which is not quite normal.

6. *Risoba obliqua*, sp. n. (Pl. I. fig. 6.)

♂.—40 mm.

Head green, tegulæ banded with brown (next the head), green, and white. Thorax white mixed with brown scales, the crest green. Pectus and hair on femora and tibiæ pale brown, tinged in parts with greenish; tarsi brown with pale rings at the joints. Abdomen above greenish, variegated, the crests dark brown; beneath dark brown, except basally.

Fore wing white, irrorated with green, especially on the apical costal area, and with thick dark brown irroration, forming a very oblique band outside the antemedial line and on oblique bar from apex and with some paler brown shading on the basal and terminal areas; nine dark points on the costa, the 2nd, 4th, 6th, and 8th representing the origin of the four principal lines. A short black streak on base of median vein, almost joining the antemedial line, which is obsolescent between the costal dark spot and M, then black, outwardly oblique and waved to hind margin; median line represented by an inwardly oblique bar from costa to SC and two oblique spots to M, where it is angled outward and becomes lost in the dark clouding; a pale ochreous patch behind base of M^2; reniform defined by a slightly oblique and elongate black ring; postmedial line double and filled in with white at the costa, lost on SC, behind which it is resumed about 3 mm. nearer the distal margin, the inner line being thick and black, the outer chiefly defined by white teeth on the veins, nearly parallel with termen, but angled inward in the cell and outward on SM^2 and to hind margin; subterminal line black, sinuous, slightly edged with whitish on the distal side, from R^2 onwards nearer termen and more strongly waved; termen spotted with black between the veins and with a fine, sinuous, black terminal line; fringe white, chequered with black between the veins.

Hind wing white, with a diffused dark cell-spot, dark suffusion on the costal area, some reddish hair towards the abdominal margin and a broad blackish border, occupying somewhat more than one-third of the wing on apical half and less than one-third towards termen; a black terminal line with a fine white line proximally to it, from below apex to fold; fringe dark, with a fine white line at base.

Underside of fore wing white, with some dark suffusion on costa, a dark cell-spot and the area distally to the postmedial line brown, excepting a pale patch behind apex; terminal markings and fringe as above. Hind wing as above, but with the costal area paler and the cell-spot more strongly defined.

Bidi, Sarawak, 1907–1908 (*C. J. Brooks*), 1 ♂.

A ♀ from Mindanao, Philippines (*I. I. Munsay*), may probably belong to the same species, but is very likely an aberration or local race. It differs in the slightly larger size (45 mm.), in the yellower tone of ground-colour on both wings and both surfaces, in the oblique antemedial band extending to costa, in the absence of dark suffusion distally to the postmedial line, in the dark bar from apex being much lighter, and in the veins being defined by black streaks towards termen. On the underside of the fore wing the cell-spot is partly joined to the black terminal area. Pending fuller knowledge, I propose to call this form *R. obliqua philippinensis* (Pl. I. fig. 7).

7. ***Risoba owgarra***, sp. n. (Pl. I. figs. 8 ♂, 9 ♀.)

=*Risoba cebea*, Hampson, Cat. Lep. Phal. xi. p. 435 (1912) (part.), nec *kebea*, Bethune-Baker, Nov. Zool. vol. xiii. p. 233 (1906) (Mt. Kebea).

This species differs in the ♂ from *kebea*, B.-Baker, with which it has hitherto been confused, in the longer palpus (1½ diameter of eye in *kebea*, twice diameter of eye in *owgarra*); in the rather smaller size (36 mm. in *owgarra*, 40 mm. in *kebea*); in the broad white subcostal area along SC–SC¹ nearly to apex (in *kebea* the antemedial green and brown shading extends broadly to middle of wing from costa to hind margin); in the absence of the white tooth between the apical dark patch and the dark mark behind SC⁵ (which in *owgarra* is merely a diffused purple-grey shade); in the reduced and more oblique basal white shade, which in *owgarra* starts from the base of SC (with narrow white line before it from base of costa) and is crenulate to about two-fifths hind margin, while in *kebea* it starts from costa and is *almost straight* to two-fifths hind margin; the white band proximally to postmedial line is less straight and regular in *owgarra* than in *kebea*, the postmedial line rather more curved and less dentate; the white marginal lunule behind M² is much smaller in *owgarra* than in *kebea*. Hind wing with the dark bordering reduced and almost without the black postmedial spots on veins.

In the ♀ there is a similar difference in size (36–38 mm. in *owgarra*, 44 mm. in *kebea*); the white basal patch is reduced and has the edge crenulate, as in the ♂, the type ♀ of *kebea* being without any dark shading on the white patch, whilst all ♀ ♀ of *owgarra* yet studied have all but a narrow line at distal edge shaded with green marked with brown; the pale postmedial costal patch extends to a point on M² in *owgarra* (in *kebea* it is intercepted by a violet shade on R³); the difference in the apical patch is as in the ♂, but the dark mark behind SC⁵ is enlarged and very black in the ♀ of *kebea*; in *kebea* ♀ the postmedial line is inwardly oblique from R³ to hind margin about 2½ mm. from antemedial line, in *owgarra* the two lines are about 5 mm. apart on hind margin.

The description of *cebea* (in Cat. Lep. Phal. xi.) seems to embrace some of the salient points of each species, the ♀ in

Brit. Mus. from Dinawa belonging to *kebea*, that from Owgarra to *owgarra*. The figure is of *kebea*.

I am indebted to Mr. Bethune-Baker for his kindness in lending me the ♂ and ♀ types of *kebea* for study.

Brit. New Guinea: Owgarra (*A. S. Meek*), 1 ♂, 3 ♀ ♀.

Acontianæ.

8. *Hylophilodes pseudorientalis*, sp. n. (Pl. I. fig. 10.)

= *Hylophilodes orientalis* ♂, Hmpsn. Cat. Lep. Phal. xi. p. 510 (fig.) (1912) (nec *Halias orientalis*, Hmpsn. Moths Ind. ii. p. 132 (1894) (Naga Hills).

Owing to the lack of sufficient material, Hampson has confused two species under the name of *orientalis*, Hmpsn., supposing them to be a dimorphic ♂ and ♀. Having access to better material, Warren discovered the existence of a second species, but, by a curious oversight, he re-named the true *orientalis* as *Hylophilodes parallela* [Nov. Zool. xxiii. 222 (1916) (Assam)], leaving the species with the red fringes and oblique postmedial line still without a name. By the kindness of Lord Rothschild, I have been permitted to study and compare the types of *orientalis* and *parallela*, which undoubtedly both belong to the species described by Hampson in Moths Ind. For the other species I propose the name of *pseudorientalis*.

Described and figured (in Cat. Lep. Phal. xi.) as *Hylophilodes orientalis* ♂.

Underside of both wings whitish, the fore wing tinged with green, especially on the costal third, and with slight black irroration just behind the costal rufous line, which is broader than above.

♀.—Differs only in the absence of the rough yellow hair on dorsum of abdomen (which in the ♂ extends almost to anus) and in the yellow tuft on abdominal margin of hind wing being reduced to a slight fringe along SM^2.

Khasis (Nat. Coll.), type and a ♀; Khasia Hills (*Nissary*), 1 ♂, 2 ♀ ♀; Cherra Ponji, 1 ♀; Burmah, 1 ♂.

Pseudorientalis can be at once distinguished from *orientalis*, Hmpsn. (=*parallela*, Warr.), by the oblique postmedial line, the rufous costa and fringes, and the thick yellow hair on dorsum of abdomen and abdominal margin of hind wing, as well as by the rather larger size (36–38 mm. as against 30–35 mm.) and the deeper green, less hyaline fore wing and rather less hyaline hind wing.

9. *Carea leucozona,* sp. n. (Pl. I. fig. 11.)

♀.—28 mm.

Head and palpus red-brown; thorax above red-brown with some white scales; tegulæ white at middle. Pectus and legs creamy-white, tinged with red-brown; fore legs predominently red-brown. Abdomen grey above, whitish irrorated with red-brown beneath.

Fore wing white, thickly irrorated with red-brown except for a broad white medial band and fine white antemedial, postmedial, and subterminal lines, the last-named tinged with violet; slight black irroration in parts; a slight black spot on the white medial band and a black reniform streak on distal edge of it. Antemedial line nearly upright, waved, close beside and almost parallel with the medial band; postmedial slightly black-edged proximally, starting near medial band, excurved from about SC^1, angled in on R^2, and curved inward between M^2 and SM^2; subterminal line near termen, following almost the same curves as the postmedial, the proximal black shading heavier; black marginal streaks between the veins; fringe ochreous shaded with reddish, white at tornus and at the tips.

Hind wing nearly uniform grey, with the fringe as on the fore wing, but without the white at tornus; fringe of abdominal margin grey; a slight cell-spot shining through from beneath.

Underside of fore wing grey, the costal margin broadly reddish; fringe as above. Hind wing with strong dark cell-spot; some reddish irroration on the distal half, especially towards costa; proximal half of wing paler.

Bidi, Sarawak, 1907–1908 (*C. J. Brooks*), type only.

Slightly recalls *C. vexilla,* Swinh., but has rather a shorter and broader fore wing and is abundantly distinct in markings.

10. *Maceda mansueta rufimacula,* subsp. n. (Pl. I. fig. 12.)

♀.—33–36 mm.

Head, thorax, abdomen, and legs not distinguishable from *M. mansueta,* Wlk.

Fore wing predominantly violet-grey, with the basal area (especially on costal half) and a fairly large subapical patch rufous—the latter crossed by a brown subterminal line. A broad diffused antemedial shade, angled outward from just behind M to two-fifths hind margin; medial area uniform violet-grey, with a minute black dot on the middle of the discocellulars; a broad diffused postmedial shade, less strongly angled inward before and behind M^2 than in the majority of *mansueta mansueta* and hardly noticeably dentate; the terminal area darker than medial area, with some rufous scales intermingled, especially near the postmedial line; subterminal line almost obsolete, except on the subapical patch; fringe brown, with a slight pale line at base.

Hind wing much as in *mansueta mansueta*, but more predominantly smoky; the termen and fringe white between and just beyond M^1 and M^2, the fringe tipped with white from R^1 to near tornus.

Underside of fore wing as in *mansueta mansueta*; hind wing with the spot on discocellulars larger and darker than usual, the dark bordering extended to near base of wing on costa and narrowed off to a point at tornus, instead of ending about M^2.

Goodenough Island, 2500–4000 ft., April 1913 (*A. S. Meek*), type and four other ♀♀.

This may be a distinct species, all five specimens being extremely uniform and unlike any *mansueta* specimens from other localities; but in the absence of the ♂ and of any discoverable structural differences, I have regarded it as a subspecies of the extremely variable *mansueta*.

CATOCALINÆ.

11. *Agonista endochrysa* Prout. (Pl. II. figs. 1 ♂, 2 ♀.)

♀.—98 mm.

Head, thorax, pectus, legs, and abdomen as in ♂, save that the black shades of the ♂ are paler and browner in the ♀.

Fore wing reddish-brown; DC^2 and DC^3 slightly darkened; a slight yellowish dash outside the discocellulars, with proximal dark shading; medial line diffused, dark reddish-brown, very upright; postmedial line greyer, very diffused, distally pale-edged, starting at two-thirds costa, angled out behind SC^5, then nearly straight to hind-margin; subterminal line represented by a series of yellowish-white, distally black-edged points between the veins, those between R^1 and SM^2 being most distinct; fringe ochreous, largely shaded with black-brown.

Hind wing reddish-brown; medial line as on fore wing; postmedial with more distinct yellow shade beyond it, very slightly bent anteriorly, then very straight to near abdominal margin, where it is lost in the yellow area, which is as in the ♂; tornal half of distal margin yellow, sparsely irrorated with brown; fringes brown from apex to about R^3, then yellow.

Underside of fore wing red-brown, with the postmedial line as above, but with distinct yellow line outside it; a row of yellow spots between the veins close to termen. Hind wing with a dark spot ringed by yellow round DC^2 and DC^3, the discocellulars themselves pale yellowish; postmedial line and yellow terminal spots as on fore wing; the yellow shade of abdominal margin extended to beyond M^2 except at base, with scattered brown vertical dashes.

North Borneo, one ♀. Also ♀ from Labuan, in imperfect condition, which seems to have the yellow areas on hind wing a little reduced.

The ♂ of this species was described in Ann. & Mag. Nat. Hist. (9) iii. p. 169 (1919), from Sandakan, N. Borneo.

12. *Achæa ochrocraspeda*, sp. n.
(Pl. II. fig. 3, ♂; Pl. III. fig. 1, ♀.)

♂.—76 mm.

Head, thorax, palpus, antenna, abdomen, and legs brown; the pectus, femora, and tibiæ (especially the hind tibia) clothed with long, woolly, brown hair.

Fore wing rich glossy brown, slightly shot with violet on the medial area, especially on the antemedial and postmedial lines, the former of which is dark brown, almost straight, from costa at 12 mm. to hind margin at 11 mm.; faint traces of darkening on DC^2 and DC^3 and of one or two curved medial shades; postmedial line brown with a white line outside it, starting from costa at 21 mm., outwardly oblique to R^2 where it is gently curved inward, then almost straight to hind margin at 18 mm.; fringe yellowish-white, having some brown shading from M^1 to M^2, then dark brown.

Hind wing rich glossy brown, the basal one-third clothed with rough thick hair; a pale curved line, just distally to middle of wing, and traces of a dotted outer line midway to termen; a small yellowish-white apical patch; fringe yellowish-white to M^1.

Underside of both wings brown with distal area paler; a dark spot on the discocellulars; a faint medial dark shade; a dentate, slightly curved postmedial line at nearly two-thirds; a broad, slightly purplish, diffused subterminal shade with somewhat crenulate outer edge, meeting dark shade from apex and tornus on fore wing; a row of minute dots close to termen; hind wing with a slight, diffused, crenulate line nearer termen; fringe as above, but with the pale parts greyer.

S. Sudan: Tamlio, Bahr-el-Ghazal, one ♂.

A ♀ from Cameroons—Bitje, early May and June, wet season (*G. L. Bates*)—appears to be the ♀ of this species, but differs in the spot on DC^2 and DC^3 of fore wing forming a narrow ring, in the more distinct medial line on upper side of fore wing and underside of both wings, and especially in the shape of postmedial line of fore wing above, which is oblique as far as R^3 and distinctly incurved posteriorly.

Near to *A. cymatius*, Prout, and *A. hypoxantha*, Hmpsn., but appears to be quite a distinct species.

13. *Achæa joiceyi*, sp. n. (Pl. III. fig. 2.)

♀.—52 mm.

Head, thorax, and palpus white marked with fuscous; the palpus with a dark dash on the outer side of each joint, tegulæ with some dark scales at base and tips, patagia and thorax with three irregular dark bands; abdomen above yellow; abdomen beneath and legs whitish, the tarsi broadly banded with fuscous; antennal shaft brown.

Fore wing white, with fuscous markings; some yellow hair behind fold at base; a dark spot at base; subbasal line represented by two broad dark bars at costa (the inner one reaching M), and a large spot behind cell; antemedial line represented by four large spots and a small one (before inner margin) on proximal side and a slightly broken line on distal side, nearly erect and angled out at fold; orbicular a small ring; reniform with dark centre and defined by a dark line, oblong, erect; a double dentate medial line from costa at middle to hind margin at middle, making a broad curve from costa to M^2, with sharp teeth, usually on the veins, and with a sharp proximal tooth cutting into the middle of the reniform; a double dentate postmedial line, following the curves of the medial, but with the lines finer, less diffused; some proximal dark shading (broadest behind costa) and a fine, dentate, distal line defining the subterminal; some black shading at termen between SC^5 and R^3; some terminal spots between the veins; a fine marginal line; fringe white chequered with fuscous.

Hind wing yellow with the discal border fuscous (narrowing and becoming broken on tornal half and interrupted by yellow at apex); margin and fringe as on fore wing; the basal hair golden-yellow.

Underside of both wings whitish irrorated with fuscous, the inner margin yellow (narrowly on fore wing, broadly on hind wing). Fore wing with diffused discal spot with spots above it at costa, a curved postmedial line, some diffused dark subterminal shading, and a row of terminal dots. Hind wing with discal dot, indistinct medial and postmedial lines (the former double) and double subterminal shading; a row of terminal dots.

Ivory Coast, 1 ♀.

This seems to be an *Achæa* species, though the under surface more resembles *Heliophisma*, which differs from *Achæa* chiefly in the more produced apex of fore wing.

Achæa indistincta, Wlk.

Mr. L. B. Prout, in his paper published in Ann. & Mag. Nat. Hist. (9) iii. p. 184 (1919), notes the fact that this species (the type of which is in Coll. Joicey) is distinct from *Achæa ablunaris*, Gn., to which Hampson sinks it (Cat. Lep. Phal. xii. p. 538). It was then overlooked that *indistincta*, Wlk., is really a synonym of *Mimophisma delunaris*, Gn., which Hampson places in the Noctuinæ. For the close relationship between these two species, see the preceding note on classification.

14. *Parallelia diffusa*, sp. n. (Pl. III. fig. 3.)

♂.—38 mm.

Head, thorax, palpus, antenna, abdomen, and legs nearly unicolorous brown, the tarsi paler and a little more ochreous in tone.

Fore wing glossy purple-brown, the basal area a little more lead-coloured, the outer medial area metallic greenish-brown, the ante- and postmedial lines dark red-brown, distally edged with flesh-colour, the oblique apical streak dark brown, proximally diffused and shading into violet. Antemedial line nearly erect, from costa at 5 mm. to hind margin at 6 mm.; a slightly incurved, diffused inner edge to the medial dark shade representing the medial line; postmedial line oblique outward from costa at 11 mm. to R^1; here acutely angled, thence nearly straight to hind margin at 10 mm.; five white spots on costa towards apex, the 1st marking the origin of the postmedial line, the 5th the origin of the subterminal, which is faintly visible as a pale streak on costal half of the apical dark patch, then represented by pale dashes on the veins; fringe purple-brown, paler between M^2 and tornus.

Hind wing nearly uniform grey-brown, with a pale terminal line, a pale subterminal dash from about M^2 to tornus and the fringe paler from behind SC^2 to R^2 and from M^2 to tornus and outer one-fourth of abdominal margin; fringe with a pale central line.

Underside of both wings grey-brown, the distal third tinged with chocolate-brown. Fore wing with five white spots on apical part of costa, a dark, distally pale-edged postmedial line, almost obsolete behind R^2, an indistinct, dentate, pale subterminal line and bluish-white shading on distal margin and basal half of fringe, especially on apical half of wing. Hind wing with faint, pale postmedial and subterminal lines and bluish-white shading on termen and fringe from behind SC^5 to tornus.

♀.—40 mm. Differs only in the slightly larger size.

Cameroons: Bitje, Ja River, early May and June, wet season (*G. L. Bates*), ♂ and 1 ♀; also a ♂ dated 1915.

This species is extremely near to *P. conjunctura*, Wlk., from Sierra Leone, but the distal margin of the fore wing is distinctly more rounded, the under surface is more sharply marked, the general tone of the fore wing is somewhat more leaden, and *conjunctura* has the inner half of the medial area of fore wing pale, the outer half bordered by a strongly curved, distinct line, instead of the two areas almost shading into each other, as in *diffusa*. The Rev. C. R. N. Burrows, who has examined the genitalia of the two species, writes: "I consider (these) distinct species. The difference in detail is very marked indeed, although in general form the suggestion is close affinity. The (?furca) is quite different. So is the costal arm." The genitalia are figured on Pl. VII.: *P. conjunctura*, fig. 2; *P. diffusa*, fig. 3. Pl. VII. figs. 4, 5 represent *P. humilis* and *isotima* [see Ann. & Mag. Nat. Hist. (9) iii. p. 185 (1919)].

15. *Attatha barlowi*, sp. n. (Pl. III. fig. 4.)

♂.—42 mm.

Head, thorax, and palpus fleshy white; frons black; tegulæ and mesothorax black; dorsum of abdomen yellow, ventral surface pale yellow; femora and hind tibiæ cream-coloured, fore- and mid-tibiæ pink, tarsi grey-brown ringed with white.

Fore wing pale flesh-colour; costal edge black towards base; a wedge-shaped black mark behind the cell; a narrow black fascia along hind margin from near base to just beyond middle; an outwardly oblique, triangular black patch just proximally to middle, its distal edge angled outward across DC^4 and its extremity produced in a narrow streak to fold near termen; carmine streaks on M^1 and M^2 distally to the dark patch; a black subtornal spot, distally edged with cerise-pink; a triangular black patch from costa at apex to near termen behind M^1, with a slight, fine line proximally to it; black spots on termen at M^1 and M^2 and a black spot on the fringe between them.

Hind wing reddish-ochreous, paler towards costa, with a wedge-shaped black mark from apex to R^3, small black spots *near* termen before and behind M^1 and at fold, and *on* termen at M^1 and M^2; veins slightly redder.

Underside of both wings ochreous-yellow; the fore wing with the irregular medial patch faintly visible and with the terminal black patch present, but less deep and glossy than above, ending at M^1, with black spots on fringe behind M^1 and at fold; hind wing with the terminal black mark ending behind R^1, without black spots behind it.

Zomba Plateau, October 1919 (*H. Barlow*).

16. *Safia mollis*, Moschl.

A ♂ of this species in Coll. Joicey, from Caparo, W. Coast of Trinidad (*F. Birch*), proves it to belong to Sect. i. of Hampson, not Sect. ii., where it is placed in Cat. Lep. Phal. xiii. p. 189. The ♂ does not appear to differ from the ♀ except in the presence of the androconia on the under surface and in the much more elongate apex of the fore wing.

17. *Safia hyalina*, sp. n. (Pl. III. fig. 5.)

♂.—50 mm.

Head, palpus, thorax, and legs black-brown irrorated with white, the thorax with a few golden scales, especially on the metathoracic crest, the tarsi white at tips of segments, mid-tibial tuft of hair paler brown. Abdomen grey-brown, with yellowish-white band on 2nd segment and spot on 3rd (a little more extended than in *S. mollis*, to which species *hyalina* seems nearest).

Fore wing semihyaline white with an ochreous tinge and some brown irroration; a few violet scales on basal one-third of wing. A black-ringed white spot behind M at base; 9 dark spots along costa, the 3rd, 5th, and 7th broad, the 8th moderate, the 9th moderate and interrupted by a minute white spot, the 2nd, 4th, 6th, 8th, and outer section of 9th forming the origin of the five lines, which are brown, irregularly waved, and dentate, more or less upright, obsolescent in parts, the medial and subterminal being most distinct, the former only a little sinuous, the latter strongly waved and dentate, with sharp distal angles behind SC^5 and R^3 and proximal ones on R^1 and M^2; faint traces of one or two other sinuous lines and of an upright lunular reniform; a row of black spots between the veins close to termen; a dark terminal line; fringe (worn) mixed grey-brown and whitish.

Hind wing with glossy brown hair from base to near termen on costal and abdominal areas in fold; marked much as in *S. mollis* (with minute white cell-spot, waved medial, postmedial, and subterminal lines, black spots between the veins near termen, black terminal line, and slight clouding between the lines); but the subterminal is a little blacker and further removed from termen and the black marginal spots are more detached in *hyalina* than in *mollis*.

Underside of both wings clothed with silky androconia, with indistinct diffused antemedial and medial lines and shadowy traces of the postmedial; costa of fore wing with 5 or 6 whitish spots on apical half, 3 fairly large.

S.E. Peru: Santo Domingo, 6000 ft., xi. 1904 (*G. Ockendon*), 1 ♂.

Easily distinguished from *S. mollis* by the larger size (30 mm. in *hyalina*, 42–46 mm. in *mollis*), the slightly more hyaline texture of wings, and the darker, broader black markings on fore wing, especially at costa, near base, and on posterior part of medial line; by the more upright reniform and more waved subterminal line, as well as by the points already mentioned on the hind wing.

18. *Zale plumbimargo*, sp. n. (Pl. III. fig. 6).

♀.—60 mm.

Head, palpus, antenna, pectus, and legs ochreous-brown; tegulæ ochreous-brown at base, with a dark brown line and tipped with blackish. Thorax above, crests and patagia blackish peppered with white and with some long brown hairs. Abdomen ochreous-brown above and beneath, the double crest on 1st basal segment rich chocolate-brown.

Fore wing pale ochreous, with the costal area, from base at inner margin gradually narrowing to apex, rich chocolate-brown, shading gradually into the ground-colour; subbasal line almost lost in the dark costal shade ; antemedial line obsolescent, from about one-third along costa, slightly oblique to just before M, where it is strongly angled inward, then oblique to base at inner margin, bordering the dark area ; pale area crossed by five or six oblique, undulating, pale brown lines, all strongly angled inwards to behind R^1, and outwards behind R^2 and R^3 ; distal area from apex to R^3 slightly irrorated with brown ; a double, oblique, red-brown subterminal line from R^3 to inner margin, with a dark leaden-grey shade between it and the brown terminal border, upon which there is a row of darker brown dots.

Hind wing with the same colouring ; basal half pale, with a dark cell-dot ; four or five diffused grey lines on postmedial area, followed by a dark red-brown line and a broad leaden-grey shade, all the lines being straight and nearly parallel to distal margin ; terminal area as on lower half of distal margin of fore wing.

Fringes of both wings brown with a pale line at base.

Underside greyish-ochreous, irrorated and strigulated with dark brown. Fore wing with two small brown dots at middle of discocellulars and a slightly crenulate brown postmedial line, slightly excurved round cell and incurved to fold, where it becomes obsolete. Hind wing with a single cell-spot, a crenulate but less curved postmedial line, and a dark subterminal streak at inner margin. Terminal dots and fringes as above.

S.E. Peru : Santo Domingo, 6000 ft., xi. 1904 (*G. Ockendon*), 1 ♀.

A single ♀ of this species in Coll. Brit. Mus., erroneously labelled "Queensland," is placed by Sir George Hampson between *Z. plumbeolinea*, Hmpsn., and *Z. unilineata*, Grote.

MOMINÆ.

19. *Elæodes barnsi*, sp. n. (Pl. III. fig. 7.)

♂.—36 mm.

Head and thorax green (the head tinged with ochreous) ; palpus predominantly black ; pectus and legs white tinged with greenish, the fore tarsus ringed with black ; abdomen greyish-white.

Fore wing white, thickly irrorated with green and in parts with blackish, the lines and stigmata white defined on each side by blackish (except a part of the postmedial line, proximally) ; the subbasal line erect and waved, almost obsolete except behind costa and M ; antemedial line from costa at nearly one-third to near middle of hind margin, nearly oblique to fold, angled in on SM^2 and out to hind margin; orbicular and reniform placed on a black streak, the orbicular triangular, the reniform broadly lunular; postmedial line oblique and slightly waved from costa at two-thirds to R^2, then inwardly oblique and waved to hind margin at about three-quarters, with the distal dark shading broadened between R^3 and M^2; subterminal line a series of white lunules between the veins close to termen, between the radials replaced by a proximal V-shaped mark filled in with black and with an irregular white patch at fold; terminal line almost obsolete; fringe white, proximally chequered with green and distally with black between the veins.

Hind wing white with the veins darkened; a slight blackish spot on DC^2 and diffused subterminal dark shade, obsolescent between SC^5 and M^2.

Underside of fore wing white tinged costally and distally with greenish; a dark spot on the discocellulars; some dark shading in the cell and between the veins postmedially. Hind wing white, behind costa broadly tinged with greenish and slightly irrorated with blackish; the distal spot larger and stronger than above; a slight postmedial line and diffused subterminal shade from costa to R^1.

Tanganyika: Niragongo Volcano, Kivu, Sept. 1919 (*T. A. Barns*).

Belongs to Sect. 1 of Hampson.

Mr. Barns states that this species is much brighter green in nature, but the colour is very fugitive.

20. *Elæodes prasinodes*, sp. n.

♂.—36 mm.

Head, thorax, pectus, and legs white mixed with pale green, the tarsi black ringed with white (fore tarsus with one ring, mid-tarsus with two rings, hind tarsus with three rings); abdomen white with the crests on basal segments and patagia at base and tips golden-green.

Fore wing white thickly irrorated basally, medially, and terminally with pale green scales, mixed here and there (especially anteriorly) with pale ochreous, leaving the lines, the base of hind margin, a medial patch behind cell, and a postmedial patch between the radials pure white. A few black scales on base of M; subbasal line defined on each side by black at costa and behind M, bent inward at costa, obsolescent on SC and behind SM^2, excurved in fold; antemedial line mostly defined by black, from one-third costa to two-fifths hind margin, slightly oblique to behind M, angled out at fold and behind SM^2; orbicular an orange round spot with three or four black dots on it, ringed by white and, distally, by black; reniform a similar black-dotted orange spot, proximally ringed by white and black, distally lost in the postmedial white patch; cell between the stigmata orange spotted with black; a black streak on fold behind the white medial patch; postmedial line proximally defined by black at costa and behind M, distally from costa to M^2 though only slightly between R^1 and R^3; from costa at two-thirds, slightly bent outward to R^1, excurved to R^3, inwardly oblique to fold, then bent outward and waved to hind margin; three white spots defined by black on costa between postmedial and subterminal lines; subterminal line dentate on the veins, bent outward on SC^5, defined by black between the radials and slightly defined by orange on posterior half of wing; fringe white, chequered with orange and black between the veins.

Hind wing pure white.

Underside of both wings pure white, with slight green spot on DC^2; fore wing with costa to near apex yellow-green, leaving a postmedial white dash defined on each side by black; a second black dash on distal side of it; fringe chequered with black.

♀.—38-44 mm.

Marked much as in ♂ or more uniformly green; sometimes with the white or the black markings much reduced. Hind wing with the discal spot visible above and with a more or less developed, curved postmedial line; sometimes also with a subterminal dark shade. Fore wing beneath broadly green on costal and terminal areas, with larger discal spot and traces of the dark postmedial shading behind R^3.

N.W. Rhodesia, 1919 (*H. C. Dolman*). Type and 1 ♀, also 4 ♀ ♀ from Solwerji, 1917–1918 (*H. C. Dolman*). All in Coll. Brit. Mus.

Belongs to Section ii. of Hampson.

Superficially a good deal resembling *E. barnsi*, but can easily be distinguished by the generally paler colouring of thorax and fore wing, by the white patches behind costa and M (these, however, are absent in some ♀ ♀ of *prasinodes*), by the whiter hind wing and under surface (in ♂), by the shape of the orbicular and colouring of the stigmata, by the tooth on subterminal line behind R^3 and absence of V-shaped angle, as well as by the difference in the antenna.

The larva was figured by Mr. Dolman, with the accompanying note:—"This pretty Noctuid larva was first found at Solwerji at the end of 'the rains,' 1917; imagines hatched in early May. Again found during July 1917 and drawn then. The larva is somewhat gregarious, two or three to plant, and adjacent plants usually with their complement too. It feeds on the fronds on the common bracken—'mushilu' (Chikaonde)—and grows with great rapidity. In captivity it pupates in a very slight cocoon made amongst the bracken fronds, the pupa being strikingly coloured. The larva has a number of fine light hairs, sparingly distributed; these do not show in the dorsal aspect. Months found:—iii. . . . . vii."

The following description is taken from the drawing:—

The larva is nearly cylindrical, the head and thoracic plate reddish, the rest of the thoracic segments yellow with a fine black dorsal line; the abdominal segments also with a fine black dorsal line, the colouring of the segments otherwise half yellow and half greenish, divided transversely by fine black lines; spiracular lines black, spiracles surrounded by white.

PLUSIANÆ.

21. *Plusia ænescens*, sp. n. (Pl. IV. fig. 1.)

♂ ♀.—34 mm.

Head and thorax grey-brown speckled with white, the patagia tipped with white; palpus and antenna brown shaded with black; dorsum of abdomen pale cinereous, with the basal tufts dark brown; body beneath darker cinereous, hair on pectus and tibiæ pale brown, the tarsi brown ringed with white.

Fore wing variegated bronze-gold and dark purplish-brown irrorated with black; subbasal line represented by a silvery streak from costa; antemedial line silvery-white tinged with gold in parts, starting from costa at two-sevenths, distally oblique to SC, deeply incurved and obsolescent to M (behind which there is a slight pale patch), sharply excurved before SM^2 with a pale violet spot in the angle, then inwardly oblique to hind margin; a shining white U-shaped stigma behind the cell, shaped much as in *limbirena*, Gn., but with the lobe separated from the U in the type (in a second specimen, otherwise practically identical, the two marks are united, as in typical *limbirena*, and the lobe is larger); an oblique, crenulate, bronze-gold postmedial shade from four-fifths costa to fold where it broadens proximally into a diffused patch extending nearly to antimedial line, then outwardly oblique to hind margin near tornus, where it is edged on each side by a white lunule; subterminal line represented by an irregular row of black and white spots and a few violet specks, nearly parallel with the postmedial shade; a conspicuous round white marginal spot at R^3, a white marginal streak in fold, and black, slightly pale-edged terminal spots.

Hind wing grey-brown with a cupreous gloss, paler at base, with a pale postmedial line and a fine pale line at base of fringe.

Underside of fore wing and distal and costal areas of hind wing shining grey-brown; a slightly crenulate, dark postmedial line running across both wings from about two-thirds costa of fore wing to near tornus of hind wing; four white dots on costa of fore wing between postmedial line and apex (less clearly visible above). Hind wing with basal inner area paler, shading gradually to grey-brown; a slight brown lunule on DC^2 and a very slight diffused subterminal line.

N. Rhodesia, 1908 (*Gimson*). Type and another ♂.

Also from Escourt, Natal, 1 ♀ in the British Museum.

Near *P. limbirena*, Gn., from which, however, it is easily distinguishable by the following characters. The fore wing is shorter on the apical half, the distal margin being slightly angled at R^3, instead of evenly curved, as in *limbirena*; the hind wing is more smoky in tone than in *limbirena*, especially on the basal area; the pale marginal mark at R^3 is a slight pinkish streak extending to M^1 in *limbirena*, an almost round white spot in *ænescens*; and the shining bronze-gold shades of *ænescens* are quite absent in *limbirena*, which is also generally less black in its darker shades—altogether less contrasted than *ænescens*.

22. *Plusia rubriflabellata*, sp. n. (Pl. IV. fig. 2.)

♂.—30–35 mm.

Head, palpus, and antennal shaft orange-brown, shaded with dark brown; collar with a fan of scarlet scales on either side of head; tegulæ, patagia, and thoracic crests purple-brown tipped with white, the crests much as in *chalcytes*, Esp., but that on the mesothorax appearing more produced; third joint of palpus longer and thicker than in *chalcytes*; dorsum of abdomen pale cinereous, the lateral tufts ochreous, springing in a spreading fan from the fifth and sixth abdominal segments and extending nearly to the anus, which has an ochreous dorsal tuft, at the extreme tip blackish, but without any sign of the black tuft beneath, which is so noticeable in good specimens of *chalcytes*; ventral surface of abdomen a mingling of brown and ochreous scales, darkened on anal segment but without long hair; pectus and legs brown, the tarsi paler.

Fore wing cupreous purple-brown, shot with gleaming bronze-gold, the lines silvery-white, outlined in bronze or brown; subbasal excurved below costa, then undulating, to fold; antemedial excurved to SC, almost obsolete in cell, inwardly oblique from M to hind margin; a white medial spot at about three-fifths costa and traces of an oblique medial line near middle of hind margin; postmedial from about two-thirds costa to hind margin near tornus, strongly undulating, excurved below costa, incurved in cell, angled outward on M^1 and less strongly so on M^2, angled inward to a deep point (much more strongly so than in *chalcytes*) in fold; subterminal line formed by bronze shading on its proximal side, straight from near apex to about SC^5 between which and R^2 it takes a deep outward curve, then straight to distal margin just behind SM^2; black marginal spots between the veins, those behind R^2 and R^3 connected by dark shading; the silvery-white stigma behind middle of cell broken into two closely-approximated, almost round spots; fringe grey with a fine pale line at base, darker at the veins.

Hind wing creamy-white at base, shading into the broad grey-brown distal border; a brown lunule on DC^2 and DC^3; traces of a postmedial line a little darker than the border; fringe creamy-white, chequered with brown at the veins on outer half.

Underside of fore wing grey-brown, with a darker postmedial line at about three-fifths and four white costal dots between this and apex; marginal spots indistinct; fringe as above. Hind wing as above, but with the postmedial line marking a sharper division between the pale proximal and dark distal areas and with the addition of a diffused dark subterminal band, its distal edge sharply angled outward on R^2.

Goodenough Is., 2500–4000 ft., March 1913 (*A. S. Meek*), type and 3 other ♂♂.

Probably nearest to *P. chalcytes*, Esp., but can be at once distinguished by the more purple tone, the straight subterminal and more deeply angled postmedial, and by the larger marginal spots, as well as by the difference in the lateral and anal tufts of abdomen and, especially, by the fans of scarlet scales on collar.

OPHIDERINÆ.

23. *Hulodes hilaris* (Warr., MS.?), sp. n. (Pl. IV. fig. 3.)

♂.—75 mm.

Head, tegulæ, pectus, and legs grey-brown; pectus, femora, tibiæ, and first four joints of hind tarsus clothed with long rough hair. Thorax above and abdomen ochreous-grey, the prothorax with bright ochreous band; patagia spotted with black and tipped with grey-brown.

Both wings shaped and marked nearly as in *Hulodes drylla*, Gn., but *hilaris* averages larger and is more ochreous in tone.

Fore wing somewhat heavily irrorated with black; subbasal and antemedial lines and black orbicular point as in *drylla*; medial bar from costa to reniform blacker; reniform lunule as in *drylla*, but with a conspicuous pale lunule surrounding the lower end of it; postmedial line starting from a black dash on costa at 15 mm., strongly angled outwards to SC^5, incurved to R^1, obsolescent to about R^3 where it reappears just proximally to a red-brown, black-mixed, oblique streak from apex, of which it becomes almost a continuation obliquely to two-fifths inner margin, where there is a black spot on distal side of it.

Hind wing marked as in *drylla*, but with the black medial line a little nearer to the body, the diffused shades between postmedial and subterminal lines red-brown (grey in *drylla*), with a broader white shade distally to the subterminal line. Termen red-brown; fringe dark brown from apex to the angle of wing, then pale to tornus.

Underside as in *drylla*, but with the lines a little more strongly marked.

A second ♂ has the red shades more ochreous.

Dutch New Guinea: Wardammen Mts., 3000–4000 ft., November 1914 (*A. E. & F. Pratt*), type and another ♂.

No doubt the New Guinea representative of *H. drylla*, but can hardly be regarded as a race, on account of the different palpus, the third segment of which in *hilaris* is slightly porrect and half the length of the second, whilst in *drylla* it is upright and less than one-third the length of segment 2.

24. *Platyja retrahens*, sp. n. (Pl. IV. fig. 4.)

♀.—57 mm.

Head, thorax, palpus, fore wing, and abdominal crests reddish-brown; abdomen above, body beneath, and legs grey-brown, tarsi with ends of segments white; hind wing and both wings beneath brown tinged in parts with reddish.

Fore wing with the lines and stigmata a little darker red-brown than the ground-colour; the oblique antemedial line and the subterminal streak from three-fifths costa to termen behind R^1 proximally edged with violet-white; the termen narrowly violet, bordered on each side by fuscous (more broadly proximally); fringe grey-brown with violet lines at base and at middle; orbicular a small round spot; reniform obliquely oblong, a little narrower at middle, with a slight violet-white line on its distal edge; a subterminal line reappearing from the dark terminal suffusion on M^2, retracted to reniform at about origin of M^1, thence obliquely waved to two-thirds hind margin; a white dot on violet terminal shade at SC^5 and similar dots proximally to dark suffusion on R^3 to M^2; veins darkened and irrorated with violet-white.

Hind wing with veins, terminal area (except at apex) and fringe as on fore wing; small white dots proximally to dark shade on R^1 to SM^2; slight dark lunule on DC^2 and DC^3.

Underside of both wings with a slight dark discal spot and a curved subterminal line, represented by white spots on the veins; terminal area (especially on fore wing) irrorated with some violet scales; fringes as above.

Upper Tonkin: Muong-Khuong, Prov. Lackay, 900–1000 m., 1 ♀.

25. *Batracharta nigritogata*, sp. n. (Pl. IV., fig. 5.)

♂.—43 mm.

Head, thorax, patagia, fore part of pectus, and palpus black, dotted here and there with ochreous-white; a raised ochreous crest on mesothorax; abdomen ochreous above, whitish beneath. Antennal shaft black-brown. Fore and mid tibia black, dotted with white; hind tibia with long ochreous-white hair; tarsi black with white tips to the joints.

Fore wing broadened on distal half by a lobe on inner margin. Ground-colour ochreous. Proximal half of wing heavily cloaked with black, dotted with ochreous (especially near costa) and containing a pale red-brown, irregularly rounded reniform, the black area extending about three-fifths along costa, strongly retracted behind cell and reaching inner margin close to body; distal half of wing of the ground-colour, thickly honeycombed with short, upright, red-brown streaks; distal border pale red-brown, irrorated with black (especially at termen) and extending round the lobe of the inner margin; fringe ochreous-brown.

Hind wing ochreous, clothed with short brown hairs;

veins and terminal line dark brown; fringe paler; the abdominal half of wing with some pale, down-turned, silky hair.

Underside of both wings pale ochreous. Fore wing clouded with grey except for a pale apical patch and slight pale subcostal and terminal borders; costa with alternate pale and dark spots; fringe tipped with brown; a large diffused black spot on discocellulars; some long pale hair in cell. Hind wing with a large, rounded, black-brown spot on discocellulars and slight brown irroration distally to it, between SC^2 and M^2.

Bidi, Sarawak, 1907–1908 (*C. J. Brooks*).

Somewhat recalls *walkeri*, Beth.-Baker, from New Guinea, and *irrorata*, Hmpsn., from Sikkim, but is abundantly distinct from both.

26. *Blosyris arpi*, sp. n. (Pl. V. fig. 1.)

♀.—100 mm.

Head, thorax above, and palpus whitish mixed with pale chestnut, a chestnut band just behind the tegulæ; abdomen above pale brown clothed with rough whitish hairs; body beneath ochreous; legs ochreous, the tarsi browner, with pale tip to each joint; a patch of deep black scales at base of mid-tibia on outer side.

Fore wing above violet-whitish, thickly irrorated with chestnut or purplish-brown, especially along basal three-fifths of costa, in an oblique patch at apex, on termen behind R^2, and between postmedial and subterminal lines from behind M^1 to hind margin. Oblique whitish subbasal and antemedial streaks on costa, defined by dark shading, the lines otherwise almost obsolete, the antemedial reappearing as an inwardly oblique, crenulate, grey streak across fold and a grey mark, further from body, before hind margin; orbicular a very small, elliptical, grey-outlined ring; reniform an elongate circle, outlined in black except on part of terminal edge; three or four outwardly oblique, deep chestnut streaks on costa between ante- and postmedial lines, reappearing as paler chestnut lines before the hind margin; a small white patch on costa between dark area and origin of postmedial line at 29 mm., outwardly oblique and indistinct behind costa, then brown, dentate, distally pale-edged; an ill-defined whitish subterminal line, more clearly visible behind R^3 where it is defined on inner side by the patch before hind margin and on the outer by a diffused ochreous shade; a double, dark brown, crenulate terminal line;

fringe ochreous-brown, darker at the veins, especially R^3 and M^1.

Hind wing with semihyaline patch on basal costal area, then whitish, thickly irrorated with purplish-brown; a small brown patch on costa between postmedial and subterminal lines and a purplish patch between R^3 and hind margin as on fore wing; purplish streaks across terminal area to the crenulations at R^3 and M^1; a slight purple streak also to M^2; a broad brown streak, defined on each side by white, across DC^2 and DC^3; two or three more or less dentate medial lines, with a purplish shade outside them; a postmedial brown line, outwardly defined by white from costa at 19 mm. to abdominal margin at 18 mm., nearly following the strong crenulations of the termen; double black terminal line and fringe as on the fore wing.

Underside of both wings ochreous-brown, the hind wing a little paler; a black spot at middle of discocellulars on each wing; broad, diffused, blackish terminal and subterminal lines on fore wing behind M^2 and on hind wing; two or three ill-defined medial lines (more distinct on costa of fore wing) and a single row of black spots before margin of both wings.

S. Brazil: Rio Grande do Sul (*Stgr.*); type and two other ♀♀, one with the upper surface more ochraceous in tone than the type.

One of these specimens bears the trade name of *Letis arpi*, but, as I cannot trace the name in print, I now publish the species as new.

27. *Serrodes curvilinea*, sp. n. (Pl. V. figs. 2 ♂, 3 ♀.)

♂.—50 mm.

Head, body, legs, and wings brown; fore wing, tornal area of hind wing, and rough hair on dorsum of abdomen and base of hind wing shot with violet.

Fore wing with an outwardly oblique subbasal dash from costa; antemedial line represented by a quadrate brown patch on costa at 5 mm., with a fine brown line (deeply angled outward on M, then inwardly oblique and thickened) connecting it with a broad black-brown patch extending to SM^2, where it is broader than at M, then a less distinct blackish line excurved to hind margin at 7 mm.; outer half of median area brown (especially towards costa) with the reniform upon it, which is an indistinct pale circle with indications of two or three small pale spots round it; postmedial line deep brown, macular, placed on a broader pale line, from costa at 13 mm., slightly sinuous and excurved to R^3, where it forms a rounded angle, inwardly oblique to fold, then slightly excurved to hind margin at 12 mm.; an indistinct row of dark subterminal spots, indicating a dentate line; slight terminal dots between the veins; fringe brown, with pale line at base.

Hind wing nearly unicolorous brown, except for the purple sheen on base, abdominal margin, and tornal area; fringe as on fore wing.

Underside of both wings pale brown, with indications of diffused medial and postmedial lines; fringes a little darker than the ground-colour, with a pale line at base.

♀.—58 mm. Marked as in the ♂, but with the pale reniform circle whiter, more conspicuous, and with more violet irroration on termen of hind wing (from about R^1 to tornus); a slight, distally pale-edged postmedial line on hind wing from about R^2 to near abdominal margin.

Underside darker than in ♂, with the lines slightly more developed.

Sarawak: Bidi, 1907–1908 (*C. J. Brooks*); type and 1 ♀.

Possibly not a true *Serrodes*, the shape of the wings and non-crenulate margins rather recalling *Athyrma*, from which, however, it is distinguished by the absence of the crest on basal segment of abdomen, the dorsum of abdomen being clothed with rough woolly hair, as in true *Serrodes*. The hair of ♂ hind tibia appears shorter than in typical *Serrodes* (the ♂ is not in perfect condition), but in other respects it seems to agree with that genus.

28. *Rhesalides keiensis*, sp. n. (Pl. V. fig. 4.)

♀.—24 mm.

Head, body, palpus, and legs whitish grey, with some tawny scales; the tarsi shaded with fuscous.

Fore wing greyish-white, tinged with rufous, with a tawny patch on disc and some fuscous subterminal shading; a broad somewhat triangular blackish patch, defined by ochreous, from behind discocellulars to hind margin, interrupted on SM^2, with its apex on hind margin; blackish subbasal and antemedial spots at costa; orbicular a black spot slightly defined by whitish; reniform tawny, slightly defined by blackish, erect, almost rectangular; postmedial line from a blackish spot at about three-fifths costa, pale, outwardly oblique to before M^1, then strongly incurved to hind margin at about three-fifths (defining the tawny and dark patches, with a few proximal dark scales from costa to M^1 expanding to a small diffused patch behind R^1) ; subterminal line indistinct, sinuous, defined by the fuscous shade, incurved about SC^2, R^2, and M^3, angled outward on R^1, behind R^3, and on SM^2; a row of dark marginal spots and a slight dark marginal line; fringe imperfect, apparently chequered tawny and brown.

Hind wing whitish, strongly diffused with fuscous-brown, with slight pale postmedial and subterminal lines from about middle of wing to abdominal margin; slight marginal spots and line as on fore wing; fringe whitish chequered with fuscous.

Underside of both wings whitish thickly irrorated with fuscous except at hind margin of fore wing (which is whitish) and on outer two-thirds of costa of fore wing (except at apex) and inner two-thirds of costa of hind wing, which are strongly tinged with deep ochreous; no clearly defined markings except the marginal ones, which are as above.

Kei Is., Dec. 1916–Feb. 1917 (*W. J. C. Frost*), 1 ♀.

Almost certainly a *Rhesalides*, near to *admiraltensis*, Hmpsn. ; vein 5 of the hind wing is almost from middle of discocellulars (being somewhat aberrant for an Ophiderid species), but in other respects the structure seems to agree perfectly.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. *Lophoruza rubrimacula*, sp. n., ♂.
Fig. 2. *Lithacodia picatina*, sp. n., ♂.
Fig. 3. *Eutelia regalis*, sp. n., ♂.
Fig. 4. *Stictoptera plumbeotincta*, sp. n., ♀.
Fig. 5. *Blenina brevicosta*, sp. n., ♀.
Fig. 6. *Risoba obliqua*, sp. n., ♂.
Fig. 7. —— —— *philippinensis*, subsp. n., ♀.
Fig. 8. —— *owgarra*, sp. n., ♂.
Fig. 9. —— ——, ♀.
Fig. 10. *Hylophilodes pseudorientalis*, sp. n., ♀.
Fig. 11. *Carea leucozona*, sp. n., ♀.
Fig. 12. *Maceda mansueta rufimacula*, subsp. n., ♀.

PLATE II.

Fig. 1. *Agonista endochrysa*, Prout, ♂.
Fig. 2. —— ——, ♀.
Fig. 3. *Achæa ochrocraspeda*, sp. n., ♂.

PLATE III.

Fig. 1. *Achæa ochrocraspeda*, sp. n., ♀.
Fig. 2. —— *joiceyi*, sp. n., ♀.

Fig. 3. *Parallelia diffusa*, sp. n., ♂.
Fig. 4. *Attatha barlowi*, sp. n., ♂.
Fig. 5. *Safia hyalina*, sp. n., ♂.
Fig. 6. *Zale plumbimargo*, sp. n., ♀.
Fig. 7. *Elæodes barnsi*, sp. n., ♂.

PLATE IV.

Fig. 1. *Plusia ænescens*, sp. n., ♂.
Fig. 2. —— *rubriflabellata*, sp. n., ♂.
Fig. 3. *Hulodes hilaris*, sp. n., ♂.
Fig. 4. *Platyja retrahens*, sp. n., ♀.
Fig. 5. *Batracharta nigritogata*, sp. n., ♂.

PLATE V.

Fig. 1. *Blosyris arpi*, sp. n., ♀.
Fig. 2. *Serrodes curvilinea*, sp. n., ♂.
Fig. 3. —— ——, ♀.
Fig. 4. *Rhesalides keiensis*, sp. n., ♀.

PLATE VI.

Fig. 1. *Arcte papuensis*, Warr.
Fig. 2. *Cocytodes cærulea*, Gn.
Fig. 3. —— *maura*, Holl.
Fig. 4. *Achæa ablunaris*, Gn.

PLATE VII.

Fig. 1. *Mimophisma delunaris*, Gn.
Fig. 2. *Parallelia conjunctura*, Walk.
Fig. 3. —— *diffusa*, sp. n.
Fig. 4. —— *humilis*, Holl.
Fig. 5. —— *isotima*, Prout.

II.—*Odonata collected in New Caledonia by the late Mr. Paul D. Montague.* By HERBERT CAMPION.

[Plates VIII. & IX.]

DESCRIPTIONS of a few of the Dragonflies occurring in New Caledonia and the adjacent Loyalty Islands may be found scattered through the writings of Father Montrouzier (1864), Brauer (1865), De Selys (1871, 1877, and 1885), and McLachlan (1886). In 1915 a special paper on "Libellen (Odonata) von Neu-Caledonien und den Loyalty-Inseln" was published by Dr. F. Ris in 'Sarasin and Roux, Nova Caledonia,' Zool. ii. The collection upon which that paper was based contained 14 species, 5 of which were brought forward as new, whilst 6 more species known to occur there were enumerated, although not represented in the collection. *Argiolestes rouxi*, Ris, however, may be synonymous with a species previously described by Montrouzier, while *Rhyothemis graphiptera*, Ramb., has been evidently overlooked (Martin, Mém. Soc. Zool. France, xiv. p. 221, 1901; Ris, Coll. Selys, Libell. p. 934, 1913). The occurrence of *Tramea loewii*, Brauer, doubtfully recorded by De Selys (Mitt. Mus. Dresden, iii. p. 293, 1878), stands in need of verification.

In 1914 large collections of insects were made in New Caledonia by the late Mr. Paul D. Montague, and were subsequently presented to the British Museum (Natural History) by the mother of the collector. These include 18 species of Dragonflies, of which 5 appear to be undescribed. The most important are the representatives of the subfamily Corduliinæ, in which group we find not only the long-lost *Synthemis miranda*, Selys, but three new species of the same genus as well, besides the unexpected occurrence of a new *Metaphya*.

Among the Agrionidæ, the material of *Isosticta* is of the greatest interest, as, in addition to yielding another new species, it completes our knowledge of the two older but imperfectly-known ones.

Of the 26 species definitely known to inhabit New Caledonia, 12 appear to be endemic to that island or the Loyalty group. These are :—

Argiolestes sarasini, Ris.
—— *ochraceus*, Montrouzier.
—— *uniseries*, Ris.
Trineuragrion percostale, Ris.
Isosticta spinipes, Selys.
—— *robustior*, Ris.
—— *tillyardi*, sp. n.
Synthemis miranda, Selys.
—— *montaguei*, sp. n.
—— *flexicauda*, sp. n.
—— *fenella*, sp. n.
Metaphya elongata, sp. n.

Of the remaining 14 species, three are both common and peculiar to New Caledonia (with the Loyalty Islands) and the New Hebrides, namely, *Agriocnemis exsudans*, Selys, *Hemicordulia fidelis*, McLach., and *Rhyothemis phyllis apicalis*, Kirby.

The presence of Synthemini provides a link with the fauna of Fiji, which is the only other island in the Pacific whence any member of the tribe has been recorded. At the same time, *Anaciæschna jaspidea*, Burm., and *Diplacodes trivialis*, Ramb., both of which are well known in Fiji, have never been met with in New Caledonia, although they might have been expected to occur there.

In addition to New Caledonia, *Hemicordulia oceanica*, Selys, has been recorded from Tahiti, the Tonga Islands, and doubtfully from New Britain.

Ischnura heterosticta, Burm., *Diplacodes bipunctata*, Brauer, and *D. hæmatodes*, Burm., are essentially Australian and Pacific forms.

Orthetrum caledonicum, Brauer, *Agrionoptera insignis allogenes*, Tillyard, and *Rhyothemis graphiptera*, Ramb., are found elsewhere on the Australian continent or in adjacent islands, while *Æschna brevistyla*, Ramb., is common to New Caledonia, Australia, and New Zealand.

Ischnura aurora, Brauer, ranges from Ceylon to Tahiti, and *Tramea limbata*, Desj., in its various forms, from Senegal to Samoa. Finally, *Pantala flavescens*, Fabr., has a world-wide distribution.

Family **Agrionidæ**.

Subfamily *Megapodagrioninæ*.

Argiolestes sarasini, Ris.

1 ♂, Mt. Nekando, 29. iii. 14; 1 ♀, Mt. Nekando, 27. v. 14; 1 ♂, Houailou R., 3–15. xi. 14.

Length of abdomen:—♂, 41 (Mt. Nekando) to 43 mm. (Houailou R.); ♀, 34 mm.

Length of hind wing:—♂, 34.5 (Houailou R.) to 35 mm. (Mt. Nekando); ♀, 31 mm.

All these specimens are considerably smaller than the types, the dimensions of which are:—Abdomen: ♂ 48, ♀ 43 mm. Hind wing: ♂ 39, ♀ 40 mm.

Argiolestes ochraceus, Montrouzier.

Sympecma Ochracea, Montrouzier, Ann. Soc. Linn. Lyon, xi. p. 247 (1864).

Argiolestes rouxi, Ris, Nova Caledonia, Zool. ii. p. 60, figs. 3 & 4 (1915).

1 ♂, Mt. Mou, 20. iii. 14 (727); 1 ♂, Baie Ngo, 25. iv. 14; 2 ♂, Mt. Canala, 13. vi. 14.

There can be no doubt that our species is the same as that described by Ris, and there can be little doubt, either, that both of them are identical with the insect which Montrouzier erroneously referred to the genus *Sympycna.*

Montrouzier's description is in the following terms:—

"*Sympecma Ochracea* (Montrousier), Kanala. Long., $0^m,045–0^m,050$. *Tête* noire. *Corselet* jaune d'ocre avec une ligne médiane et deux de chaque côté, noires. Les 5 premiers *Segments de l'abdomen* jaune d'ocre. *Bout de l'abdomen,* Pieds, Parastigmas, noirs."

Brief as it is, the description is not free from inaccuracies, for it is really the first six segments of the abdomen, and not the first five merely, which are ochraceous, and only two of the remaining segments are black, the two terminal ones being dull blue. At the same time, the species in question is immediately recognisable, not only because of its large size and striking scheme of coloration, but also by reason of the densely-veined wings and the forcipate anal appendages implied in the original generic reference.

The dimensions of Montague's specimens are:—

Mt. Mou	Abdomen	35·5 mm. (incl. anal append.).	Hind wing	26·5 mm.
Baie Ngo	Abdomen	>40·0 mm. (bent in several places).	,, ,,	30·5 ,,
Mt. Canala (1)	Abdomen	42·5 mm.	,, ,,	31·5 ,,
Mt. Canala (2)	,,	42·5 ,,	,, ,,	30·0 ,,

In total length these specimens vary from 45 mm. to 52 mm., a somewhat greater difference than the range indicated by Montrouzier (45–50 mm.). The measurements given by Ris for the male sex (abdomen 43 mm., hind wing 29 mm.) agree fairly well with those of three of the males in the present collection, but the specimen bearing the earliest date, that from Mt. Mou, is considerably smaller than the others.

In the wings of this species the anal crossing is variable in position, and may be either before, at, or after the level of the first antenodal.

Subfamily *PROTONEURINÆ.*

Genus ISOSTICTA, Selys.

Isosticta is typically a New Caledonian group, and both of the two species which have been described from that island were apparently met with by Mr. Montague. In addition, he was fortunate enough to discover a third species, which is evidently distinct from *I. spinipes*, Selys (the genotype), and *I. robustior*, Ris. This I have pleasure in naming after my friend Dr. R. J. Tillyard, whose visit to London in the summer of 1920 gave me an opportunity of discussing with him several matters of interest arising upon Mr. Montague's collection.

Although six species are now referred to *Isosticta* in all, I have not seen any of those which occur outside New Caledonia. It is not possible from the literature alone to make a complete comparison between them in respect of the labium, the hind margin of the prothorax, and the tibial armature, but, as will be gathered from the following table, they do not present any great uniformity in certain venational characters of importance. The anal appendages of the male, so far as they are known, are likewise wanting in that general likeness of form which usually characterises the members of a natural genus. Tillyard's description of *I. banksi* was accompanied by some remarks on *I. simplex* and *I. spinipes* (Proc. Linn. Soc. N. S. Wales, xxxvii. pp. 432–3, 1913). After assuming that the genotype, "so closely allied to *I. simplex* in other respects, possessed also appendages of a similar remarkable form," he went on to say that "we may fairly consider the form of the male appendages to be a generic character, which may be stated as follows: 'Both superior and inferior appendages of male somewhat forcipate, the inferior pair prolonged beyond the superior.'" As we have since learned, the inferior appendages of *I. spinipes* are neither forcipate nor prolonged beyond the superior, and consequently the proposed addition to the generic definition cannot be accepted. Indeed, the anal appendages of the two Australian species, *I. simplex* and *I. banksi*, differ in a marked degree from those of the genotype and its congeners from New Caledonia.

As at present constituted, the genus *Isosticta* includes within its limits four groups of not entirely accordant species:—

(1) Wings with M_3 separating well in advance of the subnodus, and Cu_1 ending 4–8 (usually 5–6) cells beyond the quadrangle; lower anal appendages of the male as long as the upper .... *robustior*, Ris.

(2) Wings with M_3 separating at or just before the subnodus, and Cu_1 ending 1–2 cells beyond the quadrangle; lower anal appendages of the male conspicuously longer than the upper.
    Upper appendages of ♂ depressed .... *simplex*, Martin.
    Upper appendages of ♂ straight .... *banksi*, Tillyard.

(3) Wings with M_3 separating at or just beyond the

subnodus, and Cu_1 ending 2–3 (usually 2) cells beyond the quadrangle; lower anal appendages of the male as long as the upper.

Upper appendages of ♂ expanded dorso-ventrally .... *tillyardi*, sp. n.

Upper appendages of ♂ not expanded dorso-ventrally .... *spinipes*, Selys.

(4) Wings with M_3 separating far beyond the subnodus, and Cu_1 ending 1 cell beyond the quadrangle; anal appendages of the male not known .... *filiformis*, Ris.

Isosticta tillyardi, sp. n.

1 ♂ (holotype), Mt. Canala, 13. vi. 14.

Length of abdomen 34 mm.; hind wing 21 mm.

Black, with a low metallic glaze.

Labium yellowish white; the anterior margin of the median lobe produced into a pair of long narrow processes. Labrum and clypeus blue-black, highly metallic. Genæ yellow. Hind margin of prothorax almost straight [apparently well elevated, but the posterior lobe has been split transversely]. Meso-metathorax marked with pale yellow, as follows:—A short broad band on the mesinfraepisternum and the contiguous sclerite as far as the spiracle; a long broad band on the metinfraepisternum and the second lateral suture; a fine line bordering the inferior margin of the metepimeron: the pectus with marginal streaks.

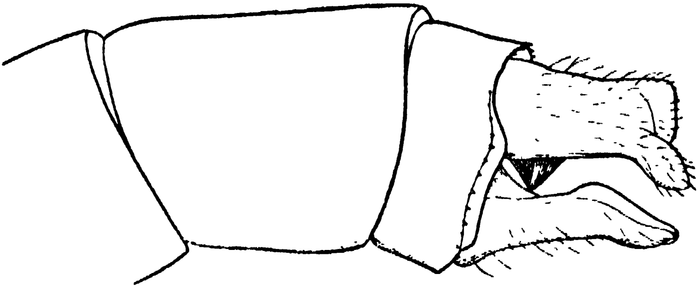
Wings hyaline. Venation black. Pterostigma c. 1 mm. long, dark reddish brown; the anterior margin conspicuously longer than the posterior margin, and the distal margin conspicuously longer and more oblique than the proximal margin. M_3 arising a little beyond the subnodus, Rs a little more remotely. Cu_1 ending two cells beyond the quadrangle. Postnodals $\frac{14 \cdot 14}{11 \cdot 12}$.

Legs with spines relatively short. Coxæ black and pale yellow; femora of fore and mid legs black, of hind legs chocolate-brown; tibiæ chocolate-brown above, brownish yellow below; tarsi chocolate-brown; claws reddish brown.

Abdomen long and slender, somewhat inflated at segments 1–2 and 8–10; a tinge of chocolate-brown on some of the segments dorsally; 1 and 2 pale yellow at sides; a pair of lateral pale yellow spots at extreme base of 3–7, coming more or less into dorsal view; on 8 and 9 and on part of 7 the tergites bordered with pale yellow interno-ventrally; 10 wholly pale yellow below; in ventral view the anterior segments are mainly yellowish, with black at apex, while most of the posterior segments are mainly blackish.

Anal appendages (fig. 1) longer than segment 10, but

Fig. 1.



Isosticta tillyardi, sp. n., ♂, holotype. Anal appendages, in left profile view. Figs. 1-11, camera-lucida drawings by P. Highley.

shorter than segment 9; the superior pair, in dorsal view, curved and convergent, broad at base, bluntly pointed at apex. In profile view, very broad throughout, slightly constricted near the middle, the inferior apical angle with a large ovate process: a large triangular tooth, apparently medio-basal in position, projecting ventrally: the inferior pair little, if at all, longer than the superior ones. In ventral view, expanded horizontally in the basal half, narrow in the apical half, and ending in an inwardly-directed hook.

1 ♀ (allotype), Mt. Canala, 12. vi. 14.

Length of abdomen 32 mm.; hind wing 23·5 mm.

Black, with a low metallic glaze. Clypeus metallic black; anterior margin of frons with a broad border of bright yellow, interrupted in the middle; the second and third joints of antennæ yellowish. Head otherwise as in ♂.

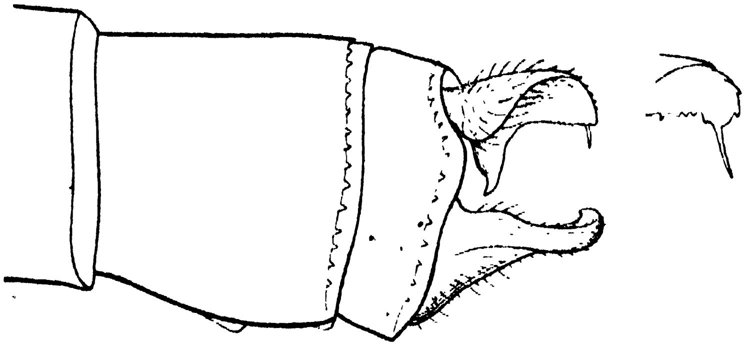
Hind margin of prothorax (fig. 3) not elevated, deeply trifid; the median division quadrangular; the lateral divisions rounded. Meso-metathorax: humeral suture lined with yellow; the whole of the metepimeron and most of the metepisternum yellow; inferior surface wholly yellow.

Wings as in ♂, except that M_3 arises at (fore wings) or a trifle before (hind wings) the subnodus, and Cu_1 invades the third cell beyond the quadrangle. Postnodals $\substack{11\\10}.\substack{13\\11}$.

Legs largely yellowish; external surface of femora mainly black; tibiæ with at least a black median streak externally; tarsi wholly black; claws reddish.

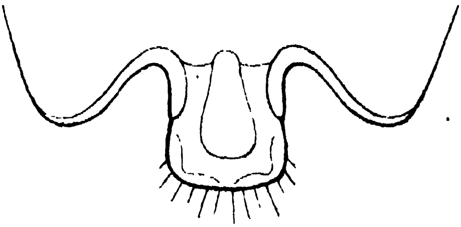
Abdomen considerably stouter than in ♂, slightly inflated at segments 8 and 9; sides yellowish, with black rings at most of the sutures; the yellowish coming into view dorsally, as spots, at the extreme base of 3–6, at least; ventral surface mainly yellowish.

Fig. 2.



Isosticta robustior, Ris, ♂. Anal appendages, in left profile view (Mt. Canala). Detail from Mt. Koghi specimen, showing longer sub-apical spine on superior appendage.

Fig. 3.



Isosticta tillyardi, sp. n., ♀, allotype. Hind margin of prothorax, in dorsal view.

Anal appendages shorter than segment 10, directed a little downwards; in dorsal view, subtriangular, bluntly pointed at apex, slightly convergent.

Ovipositor projecting so far beyond the end of the abdomen as to be conspicuously visible in dorsal view; anterior processes glossy black; valves yellowish; styles black.

Notwithstanding that the female from Mt. Koghi, which I name *I. spinipes*, agrees well with the holotype male of *I. tillyardi* in its thoracic pattern and in having Cu_1 ending two cells beyond the quadrangle, I am led to associate the Mt. Canala female with the male in question by the undermentioned points of greater resemblance :—The shorter abdomen and hind wings, the fewer postnodals, the less numerous cells between the origin of M_2 and the origin of M_{1a}. The agreement in the place and month of capture are also worthy of note.

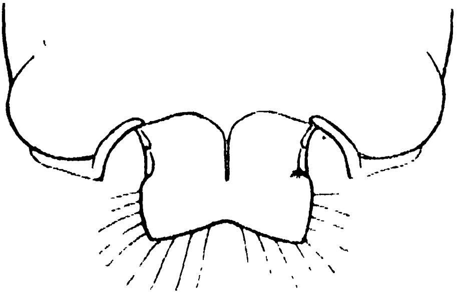
Isosticta spinipes, Selys.

1 ♀ (allotype), Mt. Koghi, 10. iv. 14 (874) (♀ hitherto unknown).

Length of abdomen 32·5 mm. ; hind wing 24·5 mm.

This specimen is almost identical in coloration with the female from Mt. Canala which I have attributed to *I. tillyardi*, but the metepisternum is entirely black behind the metastigma, as in the male of the new species. I do not attach any great importance to the length of the metastigmatic colour-line, as in one of the females of *I. robustior* in the present collection the line terminates at the metastigma, while in the other it is prolonged far beyond it. The two females are readily distinguished from one another by structural characters. In what I regard as *I. spinipes* the hind margin of the prothorax (fig. 4) has a shorter and broader median projection ; the abdomen is slenderer ; the ovipositor is shorter, little more than the styles being visible in dorsal view ; the postnodals are more numerous $\frac{(16\ \ 16)}{(12\ \ 12)}$;

Fig. 4.



Isosticta spinipes, Selys, ♀, allotype.
Hind margin of prothorax, in dorsal view.

and Cu_1 ends exactly two cells beyond the quadrangle, or at most barely enters the third cell.

It is a far more difficult matter correctly to associate these females with their respective males, but the one from Mt. Koghi agrees better with the two existing descriptions of the male of *I. spinipes* in its larger size, the more numerous postnodals, and the greater number of cells $\frac{(3\,.\,4)}{(4\,.\,4)}$ between the origin of M_2 and the origin of M_{1a}.

Isosticta robustior, Ris.

1 ♂, Mt. Koghi, 10. iv. 14 (872); 1 ♂, Mt. Canala, 14. vi. 14.

The species being founded upon two males lacking the terminal segments of the abdomen, a description of the entire insect is now given.

Length of abdomen 37 (Canala) to 37·5 (Koghi) mm.; hind wing 24 mm.

Black, with a low metallic glaze. Labium yellowish white; the anterior margin of the median lobe produced into a pair of long narrow processes. Labrum and clypeus highly metallic. Genæ yellowish or greenish.

Hind margin of prothorax entire, elevated, rounded. Meso-metathorax marked with yellow or yellowish white as follows:—A very fine line at the humeral suture; a short, rather broad band anterior to and ending at the metastigma; a rather broad band on the metepimeron, bordering the second lateral suture, connected with which anteriorly is a fine line following the inferior margin; a stripe along the inferior margin of the metinfraepisternum: the pectus with a longitudinal median line, dilated and bifid posteriorly.

Wings hyaline. Venation black. Pterostigma c. 1·5 mm. long, dark brown, pale round the edges; the anterior margin conspicuously longer than the posterior margin, and the distal margin conspicuously longer and more oblique than the proximal margin. Rs arising at the subnodus, M_3 well in advance of it. Cu_1 long, extending in all eight wings about 5½ cells beyond the quadrangle. Postnodals in fore wings 14–17 (Canala) or 15 (Koghi); in hind wings 12 (13 in one wing, Koghi).

Legs black; the coxæ and femora pale brown inferiorly.

Abdomen very long and slender, somewhat inflated at segments 1–2 and 8–10; the dorsum entirely destitute of any pale markings; pale brown beneath.

Anal appendages (fig. 2) longer than segment 10, but shorter than segment 9. The superior pair, in dorsal view, straight, very broad near the base, somewhat acutely pointed at apex; on the inferior surface a long pointed tooth near the base directed downwards, and a similarly-directed spine or bristle, variable in length, near the apex. The inferior pair little, if at all, longer than the superior; seen from above, convergent, very broad, concave, rounded at tip. In profile view, very broad basally, slender and somewhat upcurved apically.

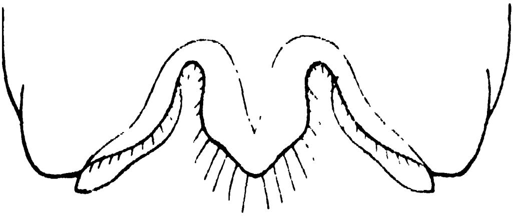
1 ♀ (allotype), Mt. Canala, 12. vi. 14 (♀ hitherto unknown).

Length of abdomen 33 mm.; hind wing 25 mm.

Coloured like the ♂, except where otherwise stated.

Prothorax with a pair of longitudinal reddish bands, in line with the antehumeral bands on the meso-metathorax, hind margin (fig. 5) deeply trifid; the divisions obtusely pointed, not elevated. Meso-metathorax with a pair of short reddish antehumeral bands, continuing the similar bands on the prothorax; the band on the metepisternum prolonged backwards far beyond the metastigma and nearly reaching the base of the thorax.

Fig. 5.



Isosticta robustior, Ris, ♀, allotype.
Hind margin of prothorax, in dorsal view.

Wings as in ♂, except that in the hind wings Cu_1 extends only five cells beyond the quadrangle, or even less. Postnodals in fore wings 15–16; in hind wings 12–13.

Legs mainly black or blackish; coxæ entirely, and femora largely, pale brown; spines on femora longer than those on tibiæ.

Abdomen shorter and stouter than in ♂, and of equal thickness throughout its length.

Anal appendages very short, hardly, if at all, longer than segment 10, straight, directed a little downwards; in dorsal view, subtriangular, bluntly pointed at apex.

Ovipositor projecting a little beyond the end of the abdomen; anterior processes translucent, dark reddish brown; valves pale yellowish proximally, mostly blackish distally; styles black, with a pale hair projecting from the apex.

A second female, from Mt. Koghi, 10. iv. 14 (873), has a longer abdomen (34·5 mm.) than the allotype, and fewer postnodal cross-veins (14 in the fore wings and 12 in the hind). In only one wing is Cu_1 of the same length as in the males; in both forewings it is fully six cells long, while in the remaining hind wing, which is also abnormal in other respects, it reaches the distal boundary of the eighth cell.

It may be pointed out that *I. robustior* has interesting relationships with several Australian members of the Protoneurinæ. In respect of venation, Ris has already pointed out that it might well go into the genus *Neosticta*, but for the more proximal position of the anal crossing in our species. The upper anal appendages, including the inferior tooth, are not very unlike those of *Nosostictа solida*, Selys, although the lower appendages are quite different.

Subfamily AGRIONINÆ.

Ischnura heterosticta, Burm.

1 ♀, Houailou R., 23. xi. 14.

This specimen, which lacks four segments of the abdomen, has been seen by Dr. Tillyard, and identified by him as an andromorphic female.

Agriocnemis exsudans, Selys.

3 ♂, Mt. Canala, 14. vi. 14; 1 ♂, Up. Houailou, 3. xii. 14.

This species was described from a unique male from New Caledonia, and appears to be the Oceanic representative of *A. argentea*, Tillyard, from Queensland. It is also known to occur in the New Hebrides, and the anal appendages have been figured by Tillyard from males received from that archipelago (Proc. Linn. Soc. N. S. Wales, xxxvii. p. 461, pl. xlviii. figs. 13, 14, 1913). The superior appendages, however, are shown with "a large basal black patch," whereas the two unbroken specimens from Mt. Canala have the upper appendages unicolorous reddish brown. In this respect our material agrees with the type, and the New Hebrides form has evidently taken on a local character. De Selys compared his very adult type of *A. exsudans* with what he considered to be *A. pygmæa*, Ramb., although he failed to notice the difference in the form of the posterior lobe of the prothorax, which is more quadrangular in *exsudans* than in the other insect. But for this and the wholly different anal appendages, it would be difficult to distinguish our specimens of *exsudans* from material of the so-called *pygmæa* from Seychelles with which I have confronted them *. The resemblance between the two species, which is at all times very close, is accentuated by the present comparison, for all four males of *exsudans* are free from the pruinosity on head, thorax, and femora which characterises the type-specimen, and one of the two which retain the last three segments of the abdomen have them coloured reddish brown, as in *pygmæa*.

Family Libellulidæ.

Subfamily CORDULIINÆ.

Hemicordulia oceanica, Selys.

1 ♂, Plaine des Lacs, 18. ii. 14 (264).

This species was originally described from Tahiti, and the British Museum possesses a male collected in that island during the visit of H.M.S. 'Challenger' in 1875. The fact, however, was not mentioned in Kirby's paper on the Neuroptera of the 'Challenger' Expedition (Ann. & Mag. Nat. Hist. (5) xiii. pp. 453–6, 1884).

1 ♀, Baie Ngo, 25. iv. 14.

Martin refers to a "♀ incomplète" in the De Selys Collection (Coll. Selys, Cord. p. 12, 1906), but the only description of that sex which seems to be available is that given by Ris of an individual from New Britain doubtfully referred to *H. oceanica* (Nova Guinea, ix., Zool. p. 503, 1913). As our specimen from New Caledonia is in good condition, and is doubtless to be associated with the male in the same collection, a brief account of it is subjoined.

Length of abdomen 37 mm.; hind wing 34·5 mm.; pterostima 2 mm.

Labium yellow; labrum yellow to brownish yellow; clypeus greenish yellow; frons hairy, orange anteriorly, metallic green above. Vertex orange, partially overlaid with metallic green. Occipital triangle orange, very hairy. Antennæ black.

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* Males of this species from Seychelles do not seem to show any essential points of difference from males of *A. hyacinthus*, Tillyard, from Queensland, which Dr. Tillyard has been kind enough to send me.

Meso-metathorax very hairy, both above and at sides pale green, with a rather low metallic glaze; pale brown beneath.

Wings uniformly tinged with brown; venation, including the costa, black; pterostigma dark reddish brown; membranule cinereous. Antenodals $\frac{7 \cdot 7}{5 \cdot 5}$. Postnodals $\frac{6 \cdot 6}{8 \cdot 7}$.

Legs black; femora of fore legs largely pale brown, of mid-legs reddish brown below.

Abdomen inflated at segment 2, slightly constricted at 3; dorsum with a low metallic glaze, chocolate-brown proximally, passing into black at 4; 10 apparently greenish brown, both dorsally and laterally: some ill-defined pale brown markings at sides of segments 1–5; sides of 6–8 with a better-defined, broad, longitudinal, pale brown stripe, apparently ceasing before the apical margin of each segment; sides of 9 with a triangular, basal, pale brown spot. Supra-anal tubercle of moderate size, black. Anal appendages about as long as segment 9, black, straight, fusiform, convergent. Vulvar lamina not projecting conspicuously, about a quarter as long as segment 9; deeply bifid, each lobe triangular.

Hemicordulia fidelis, MacLachlan.

1 ♂, Mt. Canala, 12. vi. 14.

Length of abdomen 33·5 mm.; hind wing 32 mm.; pterostigma <2 mm.

Antenodals $\frac{7 \cdot 7}{5 \cdot 5}$. Postnodals $\frac{6 \cdot 5}{8 \cdot 6}$.

Originally described from the Loyalty Islands, and subsequently recorded from New Caledonia, *Hemicordulia fidelis* also occurs in the New Hebrides. In the British Museum Collection there are two males from the island of Tanna, in the last-named archipelago, collected in April 1875, and presented by W. Wykeham Perry, of H.M.S. 'Pearl.' In one of them the hind wing measures 31·5 mm. and in the other 33 mm.

1 ♀, Noumea, 24. i. 14 (No. 106).

Length of abdomen 37 mm.; hind wing 35 mm.; pterostigma 2 mm.

Antenodals $\frac{8 \cdot 8}{5 \cdot 5}$. Postnodals $\frac{7 \cdot 7}{8 \cdot 8}$.

Particulars of the female sex were first given by Martin, from material in his own collection (Coll. Selys, Cord. p. 12, 1906), and his description applies better to the specimen before us than does the later account furnished by Ris. As regards coloration, some of the discrepancies observed may be due to the teneral condition of our specimen; and the shrivelled state of the abdomen, likewise due to immaturity, precludes the proper examination of the vulvar lamina and the supra-anal tubercle. The abdomen is conspicuously longer (37 mm.) than that of Ris's insect (31 mm.), but the measurement given by Martin (34 mm.) is just mid-way between them. In respect of the length of the hind wing, however, our specimen agrees exactly with Ris's (35 mm.), whereas Martin's measurement (31·5 mm.) is considerably less. The brown cloud in the fore wings, lying between the nodus and the apex, is a very characteristic feature of the female of *H. fidelis*, and is not observable in the same sex of *H. oceanica*, the only other representative of the genus known to occur in New Caledonia.

Genus Synthemis, Selys.

So far, the only species of *Synthemis* or any allied genus known from New Caledonia has been the large and beautiful one named by De Selys *Synthemis miranda*. The discovery of the unique specimen, a broken female lacking segments 6–10 of the abdomen, was due to Father Montrouzier, who is chiefly remembered by entomologists for his contibutions to our knowledge of the Coleoptera and Rhynchota of New Caledonia and Woodlark Island. The original description, published in 1871, has been supplemented by M. René Martin, who has given us a photograph of the wing-venation and a coloured figure of the entire specimen (Coll. Selys, Cord. p. 82, pl. iii. fig. 19, 1906). In two respects, however, the coloured figure is at variance with De Selys's description, inasmuch as it represents the lateral thoracic stripes as green, instead of yellow, and the ground-colour of the abdomen as brown, instead of steely black. The only other collector to obtain the species has been Mr. Montague, whose researches have not only completed our knowedge of it in both its sexes, but have also revealed the co-existence of three additional and undescribed species of the same genus. The re-discovery of *Synthemis miranda* in New Caledonia is an event of considerable interest, and incidentally sets at rest doubts which have been entertained in some quarters concerning the true habitat of the species. Those doubts were the outcome of a tradition to the effect that the type was found by De Selys in a milliner's shop in Paris, where it was adorning a lady's hat. It is not easy to understand how such a tradition could ever have arisen, or gained any measure of credence, when it is remembered that De Selys himself expressly declared that he received the specimen through Father Montrouzier from New Caledonia.

Synthemis miranda was placed by De Selys in a separate "groupe" of the genus, by reason of its possessing broad, extensively-coloured wings, in which the triangles and fore-wing subtriangle are divided into two or three cells. The fresh material which has now come to hand shows that the venational character is the only one of systematic importance, the great width of the wings being proper to the female sex in this and allied species. The suffusion with yellowish and brown of the basal half of each wing is merely an individual character of the type, for in the three new specimens the deep coloration never extends outwards beyond the level of the arculus.

The section of the genus of which *S. miranda* is the typical species appears to be peculiar to New Caledonia, and will include, in addition to itself, two new species to be described herein, namely, *S. montaguei* and *S. flexicauda*. It comprises species of large size, characterised by their densely reticulated wings, by the fore wings having the triangle regularly divided into two cells and the subtriangle into three cells, and by the males having white tips to their upper anal appendages.

In respect of the reticulation of their fore-wing triangles, the three large species from New Caledonia are the most archaic members of the Synthemini. In other species of that tribe it is not unusual for cross-veins to occur in the triangles, and I have received from Dr. Tillyard a female of *Eusynthemis guttata aurolineata*, Till., in which the triangles of the fore wings exactly reproduce the conditions obtaining in the Oceanic forms. But such individual cases are evidently due to the accidental reappearance of an ancestral character, whereas their presence is quite constant in the ten specimens from New Caledonia which are now known to us.

The position of the hind-wing triangle in relation to the arculus is very variable in the Synthemini. In none of the New Caledonian species is the base of the triangle removed quite as far as the middle of the supertriangle, while in *S. flexicauda* it is retracted to about a third of the supertriangle's length.

The antenodal cross-veins in these and other Synthemini exhibit two characters which one would expect to find associated with the Æschnidæ, rather than the Libellulidæ. One is the presence in all wings of an incomplete antenodal at the extreme base of the subcostal space, proximal to the first of the regular antenodals. In the second place, the antenodals of the first series do not always coincide with those of the second series; but exact coincidence, accompanied by decided hypertrophy, frequently occurs in the case of the first and third of them. Both the basal subcostal cross-vein and the hypertrophied antenodals occur in all the four species from New Caledonia, not even excepting the small, open-veined one, *S. fenella.*

Those two characters emphasise the close relationship subsisting between the Synthemini and the Æschnidæ. Indeed, *S. miranda*, *S. montaguei*, and *S. flexicauda* may be regarded as the most archaic Corduliinæ yet discovered, and the nearest to the ancestral Æschnid or Æschnid-like stock. In the presence of cross-veins in the median space, they remind one more particularly of the Chlorogomphinæ, and the wings in that subfamily exhibit the same kind of sexual dimorphism as in *Synthemis* in respect of the complexity of the anal loop, as well as the width of the wings. Furthermore, the males of Chlorogomphinæ possess the peculiar tibial keel which is found alone in themselves and the Corduliinæ. It was characteristic of De Selys that his unerring instinct immediately led him to compare *Synthemis miranda* with *Chlorogomphus magnificus*. Tillyard has drawn attention to the close similarity which the nymph of *Synthemis* bears to that of *Cordulegaster*, but it would not be surprising to find that it will present at least an equally great resemblance to *Chlorogomphus* or *Orogomphus*, whenever a nymph of one of those genera becomes known.

*Synthemis regina** is the true representative in the Australian fauna of *S. miranda* and its New Caledonian allies. For one thing, it is the nearest to them in point of size. Then, the anal loop in its hind wings consists of two enclosures in the male and three enclosures in the female sex, as in *S. miranda*. Furthermore, the resemblance to that species extends to important abdominal characters, such as the anal appendages and dorsal spine of the male and the ovipositor of the female. The existence of such a clear link between the three species before us and the more typical members of *Synthemis* seems to render it inadvisable to

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* *Synthemis regina*, in both its sexes, was described by De Selys from "Queensland" material in the "Musée brit. et collect. MacLachlan." The well-preserved male in the National Collection, ticketed "N.S.W.," and carrying De Selys's identification-label, I regard as the holotype, and have marked it accordingly. I have done this, notwithstanding the discrepancy in the locality, and the presence in the MacLachlan Collection of an incomplete male labelled "Queensland" (on white paper) and (in De Selys's handwriting) "Synthemis regina de Selys ♂" (on pink paper). The allotype is undoubtedly the female in the same private collection, carrying white and pink labels inscribed in the same way (except for the changed sex symbol) as the paratype male.

erect any new genus to receive the Oceanic forms. Another reason against generic separation may be found in the fact that *S. fenella*, notwithstanding its apparent distinctness, is evidently closely related to its larger congeners in the same island, for in all four species the hamule is of the same characteristic form. Viewed in profile, that organ is more or less definitely sickle-shaped, and projects conspicuously from the second abdominal segment, a condition of things which has no parallel in any other Synthemini I have been able to examine.

It may not be without significance that all the extra-Australian species of the *Synthemis* group which have been made known belong to the genus *Synthemis*, as restricted by the latest reviser. These are *S. primigenia*, Förster, and *S. wollastoni*, Campion, from New Guinea; *S. macrostigma*, Selys, from Fiji; and *S. miranda*, with the three new species to be brought forward herein, from New Caledonia. The remaining genera, *Eusynthemis*, *Choristhemis*, and *Synthemiopsis*, appear to occur only in continental Australia or the dependent island of Tasmania. It may be also worthy of notice that, while the genus *Synthemis* itself contains all the largest insects included in the group Synthemini, the species of greatest dimensions within the genus have an extra-Australian distribution. Even *S. macrostigma*, although only of moderate size, has its biggest representatives in Fiji and its smallest in S.W. Australia.

Synthemis miranda, Selys.

♂ (allotype), Mt. Mou, 9. iii. 14 (No. 464).

Length of abdomen 51 mm.; hind wing 39 mm.

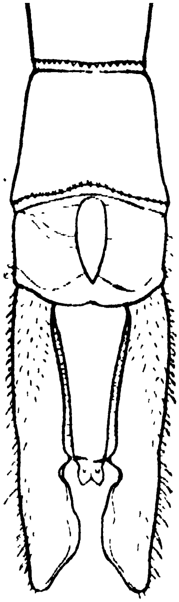
Head very hairy. Labium metallic black. Labrum metallic black, with a pair of large round golden spots near the middle. Clypeus whitish. Frons metallic blue-black, with a large whitish spot on each side, in the angle formed by the clypeus and the eye. Vertex metallic blue-black. Antennæ metallic black; the tip whitish. Occipital triangle metallic blue-black.

Prothorax black.

Meso-metathorax chocolate-brown above; below the humeral suture metallic black, with green and purple reflections; on each side an uninterrupted white stripe, of moderate width, enclosing the metastigma; a broader white stripe crossing the metepimeron.

Wings (Pl. VIII. fig. 12) hyaline, with a trace of yellow at the base, especially of the hind wing. Costa black, with a white dorsal spot at base; other veins also black. Pterostigma 3 mm. long, dark reddish brown, unbraced. Membranule of hind wing nearly as long as the anal triangle, smoky. Antenodals of the costal series $\frac{18 . 17}{12 . 12}$. Postnodals $\frac{10 . 11}{13 . 13}$. Cross-veins in median space $\frac{5 . 5}{4 . 4}$; in cubito-anal space $\frac{8 . 8}{6 . 7}$; in supertriangle $\frac{2 . 2}{1 . 1}$; and in bridge space $\frac{7 . 6}{6 . 6}$. Arculus straight or nearly so, arising between the third and fourth antenodals.

Fig. 6.



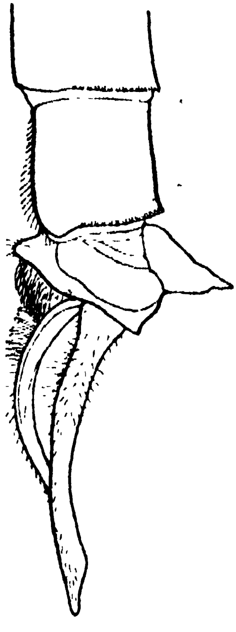
Synthemis miranda, Selys, ♂, allotype.
Anal appendages, in dorsal view.

Discoidal area in fore wings commencing with three cells, followed by two rows of cells as far as the level of base of bridge. Discoidal area in hind wings beginning with four or five large single cells. Anal loop in hind wings double, the distal enclosure containing eight cells, and the proximal enclosure four cells.

Legs black; tibial keel and femur of fore legs posteriorly whitish.

Abdomen very slender, a little constricted at segment 3 and between segments 8 and 9. Black, with yellow markings on segments 2–7 as follows:—On 2 a pair of transverse lines, rising upwards from the auricles, but not meeting at the mid-dorsal carina, and a pair of transverse linear spots placed immediately behind them on the dorsum; on 3–7 a pair of large round or oval dorsal spots near the middle of the segment, supplemented on 3 and 4 by a pair of smaller rounded spots at the base. Auricles yellow. A large, erect, pointed, black spine on the dorsum of 10.

Fig. 7.



Synthemis miranda, Selys, ♂, allotype.
Anal appendages, in left profile view.

Upper anal appendages (figs. 6 & 7) 4 mm. long; in dorsal view, broad, almost straight, with an acute internal black spine at about mid-length, followed first by an emargination, and then by a dilatation; black as far as the emargination, pale yellowish beyond. Lower anal appendage about two-thirds as long as the upper, curving upwards to the level of the superior appendages, ending in a pair of lateral tubercles, metallic dark reddish brown above, black below.

♂, Mt. Mou, 20. iii. 14 (724).

Differs from the description of the allotype in respect of the characters mentioned hereunder:—

Length of hind wing 38 mm.

A pair of round golden spots on the anterior surface of the frons. (Similar spots are dimly discernible in the allotype, but are not visible at all in any of the female specimens.) Antenodals of the costal series $\frac{18 . 16}{13 . 12}$. Postnodals $\frac{11 . 12}{15 . 13}$. Cross-veins in median space $\frac{4 . 4}{4 . 3}$; in cubito-anal space $\frac{6 . 7}{6 . 6}$; in supertriangle $\frac{1 . 2}{1 . 1}$; and in bridge space $\frac{5 . 6}{6 . 5}$. In the discoidal area of the fore wings the undivided cells continue almost to the level of the origin of M_3. Discoidal area in hind wings beginning with 5 or 6 large single cells. Distal enclosure of anal loop in hind wings containing 7 cells.

The superior anal appendages of *S. miranda* are much like those of *S. regina*, but they may be distinguished from them and the appendages of all other Synthemini by the presence of the slender internal spine upon each of them.

3 ♀, Mt. Mou, 10–20. iii. 14.

Head and thorax as in male.

Wings tinged with brown; bases suffused with saffron, which is especially dense in the subcostal space, as far as the third or fourth antenodal in the fore wings and the second or third in the hind wings. Costa black, with a white dorsal spot at base; other veins also black. Pterostigma 3·5 long, dark reddish brown, unbraced. Membranule of hind wing long, smoky. Arculus arising between the third and fourth antenodals. Discoidal area in fore wings commencing with three cells, followed by two rows of cells about as far as the level of base of bridge. Discoidal area in hind wings mostly filled with double cells as far as the level of the origin of the bridge. Anal loop in hind wing in three divisions.

Legs black; coxa and femur of fore legs largely whitish.

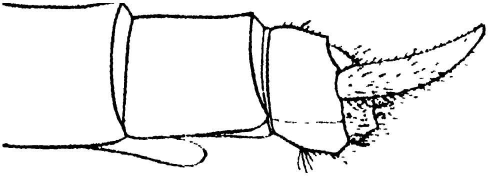
Abdomen tapering from segment 1 to segment 6, inflated from 7 to 10: metallic black, with yellowish markings on 2–7, as follows:—On 2 a large longitudinal spot on each side, sending up from its distal end a rather narrow line towards, but not reaching, the mid-dorsal line; on 3–7 a pair of rounded spots, separated by the mid-dorsal carina, placed more or less centrally, supplemented on 3–5 by a pair of spots, forming more or less of a basal ring, interrupted mid-dorsally.

Anal appendages subcylindrical, obtusely pointed, slightly convergent, and upturned, pale yellow, black at base.

Ovipositor (fig. 8) black, not reaching beyond the middle of segment 9, straight, and not projecting very far below the abdomen; the anterior processes ovate; the median processes linear, shorter than the anterior ones, and more or less fused with them.

One of the females, dated 20th March, is evidently immature, and has possibly been kept in spirit. The abdomen is much shrunken and greatly compressed laterally, and the wings, save for the basal suffusion, are entirely hyaline. The other female of the same date is fully adult, like the third specimen. All three females differ from the type, in respect that the coloured area in the wings in no case extends beyond the level of the arculus, instead of reaching to and even beyond the nodus.

Fig. 8.



Synthemis miranda, Selys, ♀. Terminal segments of abdomen, in left profile view, showing ovipositor.

In De Selys's type the hind wing is 44 mm. long, and it will be observed that, as determined by this criterion, two of Mr. Montague's specimens are smaller than the type, while the third (the one dated 10th March) is a trifle larger.

De Selys's description of the "lèvre supérieure" as "jaunâtre, largement bordée et traversée de noir" scarcely applies to any of the five specimens before us, whether male or female, since all of them have the labrum wholly back, save only for two golden spots.

As far as size and venational characters are concerned, the principal points of difference between the three females of

Synthemis miranda obtained by Mr. Montague can be stated in tabular form, as hereunder :—

	♀ No. 1 (10. iii. 14).	♀ No. 2 (724) (20. iii. 14).	♀ No. 3 (726) (20. iii. 14).
Length of abdomen	51·0+2·5	47 5+2·0	47·5+2·0
Length of hind wing	44·5	42·0	42·0
Antenodals (costal series) ..	20 21 11 14	17 17 11 11	17 11
Postnodals	12 . 11 13 . 13	11 10 11 13	11 13
Cross-veins in medion space.	4 . 5	1 1 1 . 4	5 4 . 4
Cubito-anal cross-veins ...		3 7	7 7
Cross-veins in supertriangle.		2 2	3 2 2
Bridge veins	6 6 6 . 6	5 6	5 . 5 5 . 6
Anal loop in hind wing :—			
Distal enclosure	21·23	12·12	16·18
Middle enclosure	10·10	7·6	10·8
Proximal enclosure ..	8·9	5·4	6 6

Synthemis montaguei, sp. n.

1 ♂, holotype, Mt. Mou, 10. iii. 14 (No. 488).

Length of abdomen 51 mm. ; hind wing 43 mm.

Labium pale reddish brown ; labrum pale reddish brown, the inferior margin broadly edged with black ; anteclypeus pale yellow ; postclypeus yellowish brown, at each side a large yellowish-white spot, edged with black below. Frons yellowish brown in front ; anterior third of summit yellowish brown, posterior two-thirds metallic blue-black ; hairy. Vertex dark steely blue, very hairy. Antennæ black. Occipital triangle metallic black.

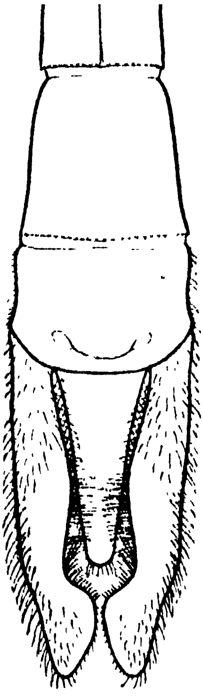
[Prothorax not visible.]

Meso-metathorax without spots or stripes, dark metallic brown, with chocolate reflections on dorsum and green reflections at sides.

Wings (Pl. VIII. fig. 13) hyaline, with a trace of brown at the base of the subcostal space. Costa golden anteriorly, with a pale dorsal spot at the base; other veins black. Pterostigma nearly 4 mm. long, dark reddish brown, weakly braced. Membranule of hind wing not quite as long as the anal triangle, smoky white. Venation dense. A basal subcostal cross-vein in each wing. Antenodals of the costal series $\frac{23 . 24}{15 . 15}$. Postnodals $\frac{12 . 11}{15 . 14}$. Cross-veins in median space

$\frac{5 . 5}{4 . 4}$; in cubito-anal space $\frac{10 . 10}{8 . 7}$; in supertriangle $\frac{3 . 3}{3 . 2}$; and in bridge space $\frac{7 . 8}{6 . 7}$. Arculus in the fore wing very oblique, in the hind wing more vertical; in all the wings straight, and placed at or near the level of the fourth antenodal of the first series. Triangle of the fore wings two-celled, subtriangle three-celled. Triangles of the hind wings with one curved cross-vein in each; the convex side of the cross-vein directed postero-basally. Discoidal area in the fore wings commencing with three cells, followed by double cells to a point between the level of the separation of M_{1+2} and the level of the nodus. Discoidal area in the hind wings with at first two rows of cells, giving place to increasingly dense rows of cells before the level of the nodus. Anal loop in the hind wing consisting of two enclosures, the primary (distal)

Fig. 9.



Synthemis montaguei, sp. n., ♂, holotype.
Anal appendages, in dorsal view.

loop containing eight cells, and the secondary (proximal) loop from four to six cells.

Legs dark reddish brown; coxæ and tibial keels pale brown.

Abdomen a little constricted at segment 3 and between segments 8 and 9. Dorsum of segment 1 and basal third of segment 2, auricles, and lateral and ventral aspects of all the segments dark reddish brown. Dorsum of the distal two-thirds of segment 2 and segments 3–10 black, with yellow markings on 2–8 as follows:—On 2 a pair of transverse lines followed immediately by a pair of subquadrate spots, both pairs interrupted mid-dorsally; on 3 and 4 a pair of basal spots, forming more or less part of a ring, and a pair of central spots somewhat rounded and almost touching one another mid-dorsally; on 5, 6, and 7 a pair of rounded spots, similar to those on 3 and 4, but placed rather more proximally and separated more decidedly by the mid-dorsal carina; on 8 a pair of large elongated spots.

Upper anal appendages (fig. 9) about 4 mm. long; in dorsal view wavy, dilated internally before the middle, then emarginate, and dilated again just before the apex, which is rather obtuse; fuscous as far as the central dilatation, whitish beyond, the apex edged with fuscous: in lateral view curving gently downwards and then upwards again, stout, rather slender at base. Lower appendage about two-thirds as long as the upper appendages, curving gently upwards, triangular in dorsal view, very dark reddish brown, glossy.

I have the honour of dedicating this very fine species to the memory of its discoverer, who afterwards gave his life in the cause of freedom on the battlefields of Macedonia. It is immediately recognised from all other Synthemini by the absence from the meso-metathorax of any pale spots or stripes.

Synthemis flexicauda, sp. n.

♂ (holotype), Mt. Nekando, 24. v. 14.

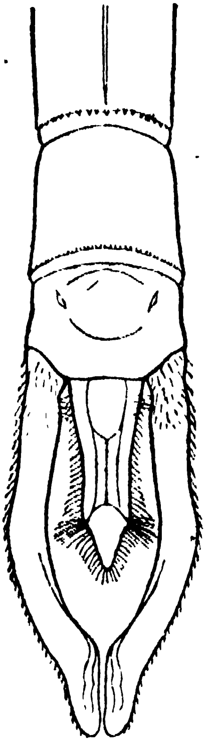
Length ot abdomen 45·5 mm.; hind wing 37 mm.

Labium creamy, crossed vertically by three dark bands. Labrum glossy black. Clypeus creamy, with a pair of black spots, elongated transversely, near the frons. Frons hairy, glossy black, with a pair of large, reniform, creamy spots occupying the greater part of the anterior surface. Vertex hairy, glossy black. Base of antennæ black [the bristle missing]. Occipital triangle hairy, glossy black.

Prothorax chocolate-brown, widely bordered with yellow anteriorly.

Meso-metathorax metallic chocolate-brown, with some greenish reflections laterally; mid-dorsal carina yellow; on each side a broad, uninterrupted, creamy stripe, enclosing the metastigma; another broad creamy stripe crossing the metepimeron.

Fig. 10.



Synthemis flexicauda, sp. n., ♂, holotype.
Anal appendages, in dorsal view.

Wings (Pl. VIII. fig. 14) slightly tinged with brown. Costa yellow anteriorly, without any pale dorsal spot at base; other veins black. Pterostigma 3·5 mm. long, dark reddish brown, weakly braced. Membranule of hind wing as long as the anal triangle, brownish. Antenodals of the costal series $\frac{18 . 19}{13 . 13}$. Postnodals $\frac{11 . 12}{13 . 14}$. Cross-veins in median space $\frac{4\ .\ 4}{3\ .\ 3}$; in cubito-anal space $\genfrac{}{}{0pt}{}{7\ .\ 7}{6\ .\ 5}$; in supertriangle $\genfrac{}{}{0pt}{}{3\ .\ 3}{1\ .\ 1}$; and in bridge space $\frac{6\ .\ 7}{5\ .\ 5}$. Arculus slightly bowed towards base of wing, arising between third and fourth antenodals. Discoidal area in fore wings commencing with four cells, followed by two rows of cells as far as the level of base of bridge. Discoidal area in hind wings first with two large cells and then with about four double cells before the multiplied rows of cells begin. Anal loop in hind wing double, the primary (distal) enclosure containing eight to nine cells and the secondary (proximal) enclosure four cells.

Legs dark reddish brown; coxæ, femora internally, and tibial keels creamy [hind legs missing].

Abdomen somewhat fusiform; a little constricted at segment 3 and between segments 8 and 9. Auricles and segment 1 dark reddish brown. Segments 2–10 black, with creamy or yellow markings as follows:—On 2 a pair of rounded spots, almost central in position; on 3–8 a pair of basal spots, forming more or less of a ring, except on 8, where they are much reduced and wider apart, and a pair of somewhat rounded spots near the middle, becoming progressively smaller, more transversely linear, more widely separated, and more retracted towards the base of the segment.

Upper anal appendages (fig. 10) a little over 5 mm. long; in dorsal view slightly divergent in the basal half, then more sharply convergent, and ending by the tips becoming dilated, parallel, and almost in contact with one another; fuscous in the first three-fifths and whitish beyond: in lateral view depressed and dilated ventrally in the middle. Lower appendage about half as long as the upper appendages, almost straight, pointed, abruptly reduced in thickness, dorso-ventrally, towards the apex, glossy black.

♀ (allotype), Mt. Nekando, 23. v. 14.

Length of abdomen 44 mm.; hind wing 38 mm.

Labium: lateral lobes blackish, with the outer margins yellow; median lobe yellowish. Labrum glossy black, with a transversely elongated yellowish spot opposite the clypeus. Clypeus yellow, with some black markings in the central area of the postclypeus. Frons hairy, glossy black, with a pair of large rounded yellow spots. Vertex hairy, glossy black. Antennæ black, with the articulations pale brown. Occipital triangle hairy, glossy black.

Prothorax chocolate-brown, widely bordered with yellow anteriorly.

Meso-metathorax metallic chocolate-brown, with some greenish reflections laterally; the mid-dorsal carina yellow; on each side a broad, uninterrupted, creamy stripe, enclosing the metastigma; another broad creamy stripe crossing the metepimeron.

Wings (Pl. IX. fig. 15) strongly tinged with brown, especially at the tips. Costa black anteriorly, with traces of pale dorsal spot at base; other veins likewise black. Pterostigma 4 mm. long, dark reddish brown, weakly braced. Membranule of hind wing long, brownish. Antenodals of the costal series $\frac{20\ \ 19}{12\ .\ 12}$. Postnodals $\frac{12\ .\ 11}{13\ .\ 15}$. Cross-veins in median space $\frac{4\ .\ 4}{3\ .\ 3}$; in cubito-anal space $\frac{8\ .\ 8}{6\ \ 7}$; in supertriangle $\frac{3\ .\ 2}{1\ .\ 1}$; and in bridge space $\frac{6\ .\ 6}{7\ .\ 7}$. Arculus slightly bowed towards base of wing, arising between third and fourth antenodals. Discoidal area in fore wings commencing with three or four cells, followed by two rows of cells as far as the level of base of bridge. Discoidal area in hind wings first with one or two large cells, and then with about four double cells, before the multiplied rows of cells begin. Anal loop in hind wing double; the primary (distal) enclosure containing nine cells, and the secondary (proximal) enclosure four to six cells.

Legs black; femora of fore legs creamy below.

Abdomen a little dilated at segments 5 and 6, black, with segments 2–7 with dark yellow markings as follows:—On 2 a narrow basal edging, connected laterally with a pair of oblique lines, broad below, and ending in an acute point before reaching the mid-dorsal carina near the middle; on 3–7 a pair of basal spots, forming more or less of a ring, and a pair of somewhat rounded spots near the middle, becoming progressively smaller, more transversely linear, and more retracted towards the base of the segment.

Anal appendages nearly 4 mm. long, sublanceolate, yellowish, except at the base, where they are black.

[Ovipositor eaten away, apparently by mites.]

An example of the "freak"-venation which is rife in *Synthemis* and its allies occurs in the right hind wing. Not only are the sectors of the arculus widely separated at their origin, but the triangle is an exaggeration of what occurs normally in, e.g., *Sympetrum*. That is to say, the cross-vein which closes the triangle above takes a downward course, and attaches itself to the distal cross-vein at about two-thirds of the height of the latter, instead of at its summit. A corresponding aberration in the fore wing has been figured for *Synthemis leachii*, Selys, *S. cyanitincta*, Tillyard, and *Pentathemis membranulata*. Karsch.

In the distribution of pale spots upon the abdomen, *S. flexicauda* reminds one of *S. leachii* from South Western Australia, but the new species is the only member of the Synthemini in which the superior anal appendages of the male are parallel and contiguous for any portion of their length.

Synthemis fenella, sp. n.

1 ♂ (holotype), Mt. Mou, 20. iii. 14 (725).

Length of abdomen 29 mm.; hind wing 25·5 mm.

Labium metallic black; median lobe bright yellow. Labrum metallic black. Anteclypeus greyish white. Postclypeus metallic black, with a large cuneiform bright yellow spot on each side. Frons metallic black; a very large, somewhat lunulate, bright yellow spot on each side of the median furrow. Vertex and occipital triangle metallic black.

Prothorax metallic black; the anterior border broadly edged with bright yellow.

Meso-metathorax dull black dorsally; metallic black, with bluish or greenish reflections at sides: three broad bright yellow stripes on each side; the first, antehumeral in position, deeply excavated externally in its posterior third; the second enclosing the metastigma; and the third lying upon the metepimeron.

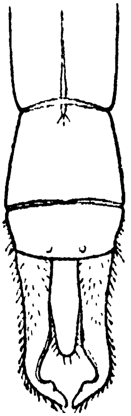
Wings (Pl. IX. fig. 16) entirely hyaline, save for a very slight trace of yellowish brown at the base. Costa yellow, with a yellow basal spot; other veins black. Pterostigma 1·5 mm. long, very broad, dark reddish brown, unbraced. Membranule cinereous. A basal subcostal cross-vein present in each wing. Most of the antenodals in the costal space exactly coincident with the subcostal antenodals; $\frac{12.12}{10.10}$. Postnodals $\frac{7.9}{10.9}$. Cross-veins in median space $\frac{3.3}{3.3}$; in cubito-anal space $\frac{5.6}{6.6}$; in supertriangle $\frac{1.1}{1.1}$; and in bridge space $\frac{6.6}{5.5}$. Arculus arising before the third antenodal in the fore wings, and after the third antenodal in the hind wings. All triangles and subtriangles free. Discoidal area in fore and hind wings for the most part filled with single cells to about the level of the origin of M_{1+2}. Anal loop in hind wing in two portions, the distal enclosure containing 8–10 cells, and the proximal enclosure 4–6 cells.

Legs black; coxa and femur of fore legs mainly yellow; tibial keels also yellow.

Abdomen a little constricted at segment 3, and somewhat dilated at segments 6–10, with another slight constriction between 8 and 9. Black, with bright yellow markings on 2–8, as follows:—On 2 an oblique line rising upwards and backwards from the auricle on each side, and ending, without reaching the mid-dorsal line, by confluence with a large wedge-shaped spot lying on its distal side; on 3–8 a pair of moderately large rounded spots, lying centrally and close together on 3, but becoming progressively more proximal, wider apart, and more elongated transversely on succeeding segments, supplemented on 3–5 by a pair of smaller rounded spots at the base.

Anal appendages (fig. 11) black. The upper pair as long as segments 9 and 10 taken together, almost straight for about two-thirds of their length, then becoming deeply excavated internally, and finally giving rise to an internal prominence and bending sharply inwards towards one another. The lower appendage about two-thirds as long as the upper ones, broad, upcurved, and ending in a rounded point.

Fig. 11.



Synthemis fenella, sp. n., ♂, holotype. Anal appendages, in dorsal view.

In venation and coloration *Synthemis fenella* bears a close general resemblance to *S. claviculata*, Tillf., from North Queensland. It is immediately distinguished from that species by its smaller size, it being, indeed, the smallest known member of the genus.

Nymph of *Synthemis* sp.

New Caledonia, 1914 (exact data not preserved).

The divergent wing-cases and general form of this nymph proclaim it to be a member of the Synthemini, the first of its kind to be found in New Caledonia. Most probably it belongs to one of the large species of *Synthemis* which have just been considered, although it is not possible to associate it with any particular one of them. Unfortunately, a preparation of the rudimentary wings, made by my friend Mr. James Waterston, reveals nothing beyond the fact that the venation is in too undeveloped a condition to afford any guide to specific identification.

While the imagines of the three large species from New Caledonia are most nearly allied to *Synthemis regina*, the single Oceanic nymph is like that of *Eusynthemis guttata* in having the median lobe of the labium produced anteriorly and a conspicuous semicircular plate projecting from the frons. In other ways, however, our specimen fails to agree with that or any other known nymph of the Synthemini, for the body is relatively smooth, instead of being distinctly hairy, and the long setæ on the lateral lobes of the mask are exceptionally few in number.

The presence of a frontal plate in nymphs of *Eusynthemis* is one of the principal characters employed by Tillyard for distinguishing that genus from *Synthemis*, and the occurrence of such a plate in an undoubted *Synthemis* nymph would show that the character cannot be used for generic separation in the manner proposed by that author. Indeed, the characters of the genera *Synthemis* and *Eusynthemis* tend to overlap, not only in the nymphs, but in the imagines as well. For example, *Eusynthemis nigra* is a *Synthemis*, if judged by the shape of the abdomen, while *Synthemis spinigera* is a *Eusynthemis*, in respect of the armature of the superior anal appendages. Two characters which remain valid for *Synthemis* are the long anal appendages of the male and the retention of the ovipositor in the female.

Description:—

Length, excluding antennæ, 28 mm.

Not conspicuously hairy.

Mask yellowish brown; in position of rest, reaching backwards to a point between the bases of the mid and hind legs; terminal hooks fully exposed; median lobe advanced to a distinctly protruding point; distal border of lateral lobes with 5 distinct teeth on right side and 6 on left side; primary mental setæ, 7 on right side and 8 on left; secondary setæ, 4 on each side; lateral setæ, 4 on right and 3 on left. Antennæ 3 mm. long, carrying a few fine hairs; the two basal joints dark reddish brown, swollen, the second larger than the first; joints 3–7 light brown; the third joint longer than the fourth and fifth taken together. A conspicuous, dark reddish-brown plate, with a semi-circular anterior border, fringed with coarse yellow hairs, projecting forward from the frons, between the antennæ. Eyes pale brown, rather prominent (considerably larger than in *S. eustalacta*). Greatest width of head 7 mm. The occiput ornamented with a well-marked bilaterally symmetrical pattern, altogether more complex than that figured by Tillyard for *S. eustalacta*, composed of dark reddish-brown markings upon a light brown surface.

Prothorax short and broad; each lateral margin carrying a tuft of long hairs. Wing-cases 8·5 mm. long, light brown, flat, smooth, strongly divergent, reaching backwards to about the level of the middle of the fifth abdominal segment. Legs moderately robust, dark reddish brown.

Abdomen 16 mm. long; unicolorous dark reddish brown; elongate-oval; well-arched above; nearly flat below; smooth, except for a few hairs on the lateral margins of the more anterior segments; segments 2–9 with a postero-lateral spine on each side, curved and rather large on the three more proximal segments, straighter and smaller on the five more distal segments. The two lateral anal appendages but slightly curved, the other three more decidedly so.

Metaphya elongata, sp. n,

1 ♀ (holotype), Baie Ngo, 10. ii. 14 (204).

In studying this insect I have had before me the unique male and female of *Metaphya micans*, Laidlaw, the type of the genus, from Borneo *, and the description and figures of *M. tillyardi*, Ris, ♀, from New Guinea †. It agrees with the genotype in the following characters:—Absence of cross-veins in the median space, the cubital space (apart from the anal crossing), the triangles, and the subtriangle of the fore wing; small pterostigma; fore wing with discoidal area beginning with one row of cells, and with M_4 and Cu_1 diverging towards the margin of the wing; coincidence with the arculus of the proximal side of the hind-wing triangle; elongated anal loop, divided longitudinally and cut off straight at the end; and development of the vulvar lamina into a large spoon-shaped structure. It differs chiefly in having the postanal cell divided, the discoidal area in the hind wing beginning with two rows of cells, and the hind wings relatively narrower and conspicuously shorter than the abdomen. In some of these particulars *M. elongata* agrees with its nearer geographical neighbour, *M. tillyardi*, such as the division of the postanal cell in the fore wing and the doubling of the discoidal cells in the hind wing. In the circumstances, it seems to be advisable to refer this interesting species to the genus *Metaphya*, the range of which is thus greatly extended in an easterly direction.

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* Sarawak Mus. Journ. i. no. 2 (1912), ♂; Proc. Zool. Soc. London, 1913, p. 65, ♀.

† Nova Guinea, ix., Zool. p. 497 (1918).

The following comparison will show that *Metaphya elongata* differs from both its congeners in having the abdomen longer than the hind wing:—

Metaphya	*micans*, ♀.	*tillyardi*, ♀.	*elongata*, ♀.
Abdomen	20 mm.	27 mm.	33 mm.
Hind wing	23 mm.	31 mm.	28 mm.

It also differs from both of them in respect that the gonapophyses of segment 8 do not project beyond the apex of segment 10. It is possible, however, that this structure has become displaced in our specimen. Another difference between *M. elongata* and *M. micans*, at all events, is to be found in the apical plates of the gonapophyses, which are separate in the genotype, but fused together in the species from New Caledonia.

♀.—Length of abdomen 33 mm.; hind wing 28 mm.

Labium smoky brown. Labrum, clypeus, and frons metallic blue-black. Antennæ black. Median eye-line long. Occipital triangle small, metallic blue-black.

Prothorax pale brown. Meso-metathorax unicolorous dark metallic green, except for a large brownish area in the angle formed by the anterior margin and the humeral suture.

Wings (Pl. IX. fig. 17) hyaline, with basal saffron suffusion, reaching to the triangle in the fore wing and to the second antenodal in the hind wing, where it does not extend posteriorly much below the anal vein. Venation black. Pterostigma 2 mm. long, dark brown. Membranule of hind wing smoky white. Antenodals $\begin{smallmatrix}8\,.\,7\\5\,.\,5\end{smallmatrix}$. Postnodals $\begin{smallmatrix}5\ \ 5\\6\,.\,6\end{smallmatrix}$. Arculus in both wings nearer the second antenodal than the first. Base of hind-wing triangle slightly proximal to the arculus; the anterior cross-vein joining distally, not M_4, but the posterior cross-vein. Anal loop containing 12 or 13 cells.

Legs black, with pale areas at base.

Abdomen somewhat crushed and distorted beyond segment 4; segments 1 and 2 inflated; 3 sharply constricted; 4 and 5 enlarged and cylindrical; 6 and 7 apparently compressed laterally; 8, 9, and 10 rather broad: metallic black, without any pale markings, beyond a moderately broad brownish-yellow ring at the junction of segments 2 and 3. Anal appendages cylindrical, black. Gonapophyses of segment 8 metallic black, not quite reaching the end of the abdomen, rounded at apex, and convex ventrally; the two apical plates fused together into a single piece, weakly carinated mid-ventrally.

Subfamily *Libellulinæ.*

Orthetrum caledonicum, Brauer.

1 ♀, Plaine des Lacs, 24. ii. 14 (No. 346); 1 ♂, 2 ♀, Mt. Mou, 9. iii. 14 (465–467); 1 ♀, Mt. Mou, 10. iii. 14 (487).

The single male is olive-brown, like the females, it not yet having acquired the pale blue pruinosity proper to the adult stage of its sex.

Diplacodes hæmatodes, Burm.

2 ♂, Mt. Canala, 12 & 14. vi. 14.

The individual of later date has an extraordinary amount of saffron suffusion in the wings, and especially in the hind pair, where the coloured area extends beyond the anal loop posteriorly, and touches the nodus anteriorly. In the fore wings the suffusion ceases at about the level of the triangle.

Diplacodes bipunctata, Brauer.

2 ♂, Noumea, 24. i. 14 (Nos. 104, 105); 1 ♂, Plaine des Lacs, 18. ii. 14 (No. 265).

These specimens are remarkable for the amount of saffron suffusion at the base of the wings, the colour reaching outwards to about the level of the first antenodal in both pairs of wings. They evidently correspond with the two females from the same island mentioned by Ris (Coll. Selys, Libell. p. 472, 1911), and also with the females from New Zealand to which McLachlan applied the varietal name *novæ-zealandiæ* (Ent. Mo. Mag. xxx. p. 271, 1894). The species itself was originally described from Tahiti and New Caledonia, and it would be interesting to know how far the material before us agrees with Brauer's types.

Pantala flavescens, Fabr.

1 ♂ (203), Baie Ngo, 10. ii. 14; 1 ♂ (249), 1 ♀ (248), Plaine des Lacs, 17. ii. 14; 3 ♂ (349, 350, 352), 1 ♀ (351), Plaine des Lacs, 25. ii. 14; 1 ♂, Mt. Nekando, 25. v. 14; 2 ♀, Canala, 23. vi. 14.

2 nymphs, Mt. Canala, 12. vi. 14.

EXPLANATION OF THE PLATES.

Wing-photographs by F. W. Campion.

PLATE VIII.

Fig. 12. *Synthemis miranda*, Selys, ♂, allotype.
Fig. 13. *Synthemis montaguei*, sp. n., ♂, holotype.
Fig. 14. *Synthemis flexicauda*, sp. n., ♂, holotype.

PLATE IX.

Fig. 15. *Synthemis flexicauda*, sp. n., ♀, allotype.
Fig. 16. *Synthemis fenella*, sp. n., ♂, holotype.
Fig. 17. *Metaphya elongata*, sp. n., ♀, holotype.

III.—*The Old-World Species of* Eriocera *in the British Museum Collection* (*Diptera*, Tipulidæ). By F. W. EDWARDS.

(Published by permission of the Trustees of the British Museum.)

[Plate X. figs. 1-12.]

THE genus *Eriocera* * has long been familiar to students of Nematocerous Diptera, many representatives having been met with and described by the early workers on the order—Wiedemann, Macquart, and Walker; these were discussed and their number added to by Osten-Sacken; more recently a considerable number of species have been described by Alexander, Brunetti, Enderlein, and de Meijere, so that at the present time the number of known species is very considerable. Having regard to this fact, and also to the conspicuous and varied ornamentation of many of the species, it is not surprising that attempts have been made to dismember the genus. The first of these (apart from generic names proposed independently by earlier authors) was that of Osten-Sacken, who proposed the name *Arrhenica* for s species with long antennæ in the male sex, and also maintained as distinct Schiner's genus *Penthoptera.* For th latter proceeding I can see no justification whatever; th minute characters which Osten-Sacken depended upon see to me to be entirely trivial.

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* With a strict application of the rule of priority, the name *Caloptera*, Guérin, should be used for this genus, since it was published with a recognizable figure (though without verbal description) eight years before *Eriocera*.

A further attempt at division was that of Enderlein (1912), who recognized four groups—*Arrhenica* and *Androclosma* with long antennæ in the male, *Physecrania* and *Eriocera* with short male antennæ; *Arrhenica* and *Physecrania* with five posterior cells, the other two with only four. Brunetti and Alexander have both maintained that these divisions were unnatural and untenable, and after a careful study of the material in the British Museum, I am bound to accept their view. In particular, the length of the male antennæ proves to be totally unreliable as an indication of relationship. This is admirably shown by the three species, *E. verticalis*, *E. fusca*, and *E. yerburyi*. In the first the male antennæ are almost three times as long as the body, while in the second they are like those of the female, not longer than the thorax. The two species, however, resemble one another rather closely in their general black coloration, the venation is very similar, and, most important of all, the male hypopygia are barely distinguishable. If further confirmation were needed of the close relationship of these two species, it is provided by *E. yerburyi*, which differs from *E. verticalis* chiefly in the male antennæ being only about as long as the body. On the other hand, Enderlein associated with *E. verticalis* in the genus *Androclosma* his *A. ornatum*, which likewise has greatly elongated antennæ in the male sex. This species, however, is so very distinctive in its wing-markings, its venation, and its hypopygial structure that it obviously has only remote connection with *E. verticalis* and *E. fusca*. The third species of Enderlein's, *Androclosma* (*E. lunata*, Westw.), also occupies a rather isolated position, and does not show any very marked relationship either to *E. ornata* or *E. verticalis*, apart from the form of the male antennæ.

Whatever may be the biological significance of the elongation of the male antennæ, it is interesting to note that the same phenomenon occurs in an equal degree in the Tipuline genus *Macromastix*, and that in both these genera the elongation is accompanied by a great enlargement of the basal joint and of the frontal tubercle—perhaps for the accommodation of larger muscles necessary for moving the heavier antennæ. Another feature seen in most, if not all, species of *Eriocera* and *Macromastix* with elongate male antennæ is the reduction in the length of the abdomen in that sex.

Turning to the other point on which Enderlein based his generic distinctions, the number of posterior cells (presence or absence of cell M_1), here again it is doubtful if the distinction has any phylogenetic value. Among those with cell M_1, as among those without it, there are a number of species-groups which, if the genus were divided, might be made into subgenera, but a study of the details of venation and male hypopygium suggests that some of those without cell M_1 may be more nearly related to those possessing it than to others which do not. Moreover, those possessing the cell are certainly not all closely related among themselves.

Rather than subdivide the genus into a number of natural but small and poorly definable groups, I consider it will be preferable to enlarge it by including the genus *Penthoptera*, and also two species from the Seychelles which I referred in 1912 to *Anisomera*. One of these species shows a remarkable variation in venation which I overlooked at the time of description, and they both differ markedly from the typical species of *Hexatoma* (*Anisomera*) in having a well-developed ovipositor. Further, it is quite obvious that they are closely related to the two species of *Eriocera* described from the same islands. On the other hand, I consider that the two species with a short fleshy ovipositor (the African *E. pusilla*, Alex., and the N. American *E. longicornis*, Walker) would be at least equally well placed in *Hexatoma*.

The tendency to the development of local forms is strongly marked throughout the genus, and there are very few species which have a wide distribution. This may be accounted for by the breeding-habits of the species, most of which probably spend their early stages in the ground at the edges of rapid streams, and probably do not migrate much from one valley to another.

In the following table of species, all those at present known from the Palæarctic, Oriental, Australasian, and Ethiopian regions are included, only American forms being omitted. So far as possible, the diagnostic characters have been arranged to give what appears to be a natural arrangement of the species, but there are a considerable number which I have not seen, and whose proper position is therefore more or less a matter of conjecture. Nevertheless, there are no fewer than sixty species in the National Collection from the regions under consideration, and it is probable that these represent most, if not all, of the main groups of the genus, although more than a score of them are unfortunately represented by females only.

I wish to express my thanks and indebtedness to my friends Dr. C. P. Alexander, Mr. E. Brunetti, and Herr M. P. Riedel for the loan or presentation of several types and other specimens.

Key to Old-World Species of Eriocera (sens. lat.).

(Those marked * have not been seen by the author.)

1.	Rs at least twice as long as R; R_3 upturned and ending well before the tip of the wing; Cu_1 widely divergent from M_3, and forming an angle with the lower margin of the discal cell; wings elaborately streaked with dark. (Sumatra, Borneo.)	*ornata* (End.).
	Rs less than twice as long as R, usually much less (but compare *obscuripennis*, Edw.); R_3 not upturned at tip and ending close to the tip of the wing; Cu_1 parallel with M_3, and almost in a straight line with the lower margin of the discal cell; wings not conspicuously streaked with dark	2.
2.	Cross-vein *r* placed about the middle of R_{2+3}, which is much longer than R_2. (Seychelles.)	*luteipennis* (Edw.).
	Cross-vein *r* placed much beyond the middle of R_{2+3}, usually beyond it on R_2	3.
3.	Sc ending opposite or before the apex of Rs; Ax straight, or convex towards An.	4.
	Sc ending at least slightly beyond the apex of Rs; Ax longer and more or less concave towards An	10.
4.	R_{2+3} almost as long as, or even longer than, R_2; wing-membrane brownish with dense microtrichia (normal); Ax noticeably convex towards An; small reddish species. (Seychelles.)	5.
	R_{2+3} much shorter than R_2; wing-membrane hyaline, the microtrichia abnormally sparse; Ax practically straight. (Ceylon.)	7.
5.	Wing-membrane towards tip with distinct macrotrichia.................	*obscuripennis*, Edw.
	Wing-membrane without macrotrichia..	6.
6.	Wings with pale streaks in the cells; four posterior cells..................	*fuscinervis*, Edw.
	Wing uniformly brownish; three posterior cells	*ferruginea* (Edw.).

7. Black species; wings perfectly hyaline . *crystalloptera*, O.-S.
At least partly orange, or wings with dark bands .... 8.

8. Wings with dark bands; abdomen and sometimes the thorax black.......... *humberti*, O.-S.
Wings without dark bands............ 9.

9. Thorax orange with black stripes, abdomen black .... *meleagris*, O.-S.
Thorax entirely, abdomen mainly orange. **pachyrrhina*, O.-S.

10. Upper basal cell at its apex quite twice as broad as the lower; wings with conspicuous markings; Rs parallel with R_1 near the base. (Borneo.) .... *lunata*, Westw.
Upper basal cell little if any broader than the lower; Rs not parallel with R_1 near the base .... 11.

11. R_2 much shorter than R_{2+3}; tip of R_1 upturned and slightly shorter than r; small black species; male antennæ elongate; anal cerci of female short and fleshy. (Tropical Africa.) ...... *pusilla*, Alex.
R_2 at least as long as R_{2+3}; tip of R_1 straight, or at most slightly upturned, as long as or longer than r; anal cerci of female long and horny............ 12.

12. R_2 little if any longer than R_{2+3}; r at or close to base of R_2; Cu_1a near base of discal cell; four posterior cells; uniformly blackish or brown species; wings without markings other than the stigma .... 13.
R_2 longer than R_{2+3} (nearly always much longer, but compare *E. ctenophoroides*); r generally well beyond base of R_2; Cu_1a generally well beyond base of discal cell .... 25.

13. Rather light brown species; the thorax with darker stripes; wings practically clear. (Australia.) .... 14.
Darker brown to black species; wings more or less infuscated.............. 15.

14. Discal cell closed .... *australiensis*, Alex.
Discal cell open....... .... *aperta*, Alex.

15. Whole body deep black, not at all shining. (India.) .... **aterrima*, Brun.
Not wholly black, or, if so, then partly shining .... 16.

16. Male antennæ twice as long as the body; unicolorous black. (Amboina.)...... **atra*, Dol.
Male antennæ more or less than twice as long as the body .... 17.

17. Head yellowish, at least on the frontal tubercle; male antennæ more or less elongate .... 18.
Head entirely dark; antennæ alike in the two sexes..................... 21.

18.	Thorax and abdomen almost wholly shining black. (Tropical Africa.)	*nyasicola*, Alex.
	Thorax scarcely or not shining, both it and the abdomen black	19.
19.	Male antennæ a little shorter than the body; cross-vein *r* at base of R_2. (Ceylon.)	*yerburyi*, sp. n.
	Male antennæ three times as long as the body; cross-vein *r* a little beyond base of R_2	20.
20.	Cu_1a a little beyond base of discal cell. (Oriental region.)	*verticalis*, Wied. (= *moriokana*, Mats.).
	Cu_1a exactly at base of discal cell. (Africa.)........................	*tumidiscapa*, Alex.
21.	Abdomen shining black	22.
	Abdomen dull	23.
22.	Wings yellowish at the base. (S. Europe.)	**cimicoides* (Scop.).
	Wings entirely blackish. (Formosa.) ..	*nigrina*, Riedel.
23.	Thorax grey with four strongly shining black stripes. (Hungary.)	**grisea* (Riedel).
	Thorax blackish brown with three moderately shining black stripes	24.
24.	Stigma absent; legs with strong bluish-metallic reflections. (Ceylon.)	*fusca*, Edw.
	Stigma distinct; legs with faint bluish reflections. (Japan.)	*nipponensis*, Alex.
25.	Wings with a conspicuous dark blotch at base of Rs, and other dark markings on a pale ground.....................	26.
	Wings with a blackish ground-colour, with or without pale markings, or lighter with a stigma only	27.
26.	Costal cell dark; head and thorax shining blue-black. (India.)	*tripunctipennis*, Brun.
	Costal cell yellowish; head and thorax dull greyish. (Japan.)	*longifurca*, Alex.
27.	Wings moderately infuscated, without pale markings; stigma present, though sometimes faint; cross-vein *r* about its own length distant from tip of R_1	28.
	Wings darker, often with distinct markings; stigma absent; cross-vein *r* more than its own length distant from tip of R_1 (usually much more)	34.
28.	Very large species; thorax densely hairy; frontal tubercle well developed. (Japan.)	*stricklandi*, sp. n.
	Medium-sized or small species; thorax practically bare; frontal tubercle feebly developed	29.
29.	Four posterior cells; sides of mesonotum with velvet-black spots	30.
	Five posterior cells; sides of mesonotum without velvet-black spots	31.
30.	Thorax black. (India.)	*rufiventris*, Brun.
	Thorax mainly reddish. (Sumatra.) ..	*pænulata*, End.
31.	Cell M_1 more than twice as long as its petiole; discal cell not much longer	

than broad; whole body orange. (Himalayas.) .... *aurantia*, Brun.

Cell M_1 about as long as its petiole; discal cell rather elongate; wings narrower in proportion .... 32.

32. *r–m* cross-vein twice its length beyond fork of Rs; head black above. (Borneo.) *rubrescens* (Walk.).

r–m cross-vein close to fork of Rs; head lighter .... 33.

33. Thorax uniformly orange. (Borneo.) .. *pyrrhochroma* (Walk.).

Thorax brownish yellow, with three light reddish-brown stripes. (Sumatra.) .. **angustipennis* (End.).

34. Wings without distinct markings ...... 35.

Wings with distinct white or yellowish markings at the tip, or in the middle, or in both places (markings faint in *robinsoni*) .... 57.

35. Abdomen without distinct shining bands. 36.

Abdomen black, with alternating shining and velvety bands .... 55.

36. Metatarsi white. (S. Europe.) .... **chirothecata* (Scop.).

Metatarsi not white (unknown in *waterstoni*) .... 37.

37. Abdomen entirely black; five posterior cells .... 37 *a*.

Abdomen at least partly orange ...... 40.

37 *a*. Head and base of antennæ orange. (Madagascar.) .... **obscura*, Big.

Head and antennæ dark .... 38.

38. Thorax grey, with three shining black stripes; wings light brown. (Corsica.) *schnusei* (Kuntze).

Thorax black; wings blackish .... 39.

39. Thorax dull; abdomen somewhat shining. (Macedonia.) .... *watersloni*, sp. n.

Thorax shining; abdomen dull .... **unicolor*, Meij.

40. Wings darkest along costa and on apical third; five posterior cells .... 41.

Wings uniformly dark (rarely yellow at the base) .... 42.

41. Abdominal segments 1–3 [or 2–4?] orange. (Java; Formosa.) .... **nigripennis*, Meij.

Abdominal segments 2–5 orange, with narrow blackish hind borders. (India.) *semilimpida*, Brun. [(=*maculiventris*, Brun.).

42. Abdomen with segments 1–4 or 2–5 entirely yellow or orange; 5–8 or 6–8 entirely blackish; five posterior cells (except in *shirakii*) .... 43.

Abdomen otherwise coloured; four posterior cells .... 48.

43. Thorax mainly or wholly red.......... 44.

Thorax black .... 45.

44. Thorax with dark stripes; femora yellow except at tip; six distinct flagellar joints in female .... **ferruginosa*, Wulp.

Thorax unstriped; femora black except at base; ten distinct flagellar joints in female .... **nigroapicalis*, Brun.

45. Flagellum of antennæ and base of wing yellow. (Borneo.) .... *dichroa*, Walk.
Flagellum black; wings entirely blackish. 46.

46. Abdominal segments 1–4 orange; length 20 mm. (Penang.) .... *umbripennis*, sp. n.
Abdominal segments 2–5 orange ...... 47.

47. Five posterior cells; length 8 mm.; male antennæ as long as thorax. (Java.) .... *xanthopyga, Meij.
Four posterior cells; length 14 mm.; male antennæ longer than the thorax. (Formosa.) .... *shirakii*, sp. n.

48. Thorax extraordinarily humped; front half of præscutum yellowish; the remainder of the thorax dark brown; abdomen almost entirely ochreous-orange. (Ceylon.) .... *tuberculifera*, Edw.
Thorax not more humped than usual; both it and the abdomen quite differently coloured .... 49.

49. $Cu_{1}a$ at base of discal cell. (Sumatra.) . *simalurensis, Meij.
$Cu_{1}a$ well beyond base of discal cell .... 50.

50. Head and thorax wholly blackish ...... 51.
Head and thorax partly orange or reddish. 53.

51. Wings yellowish at the base; abdominal segments 1–6 with black apical triangles. (India.) .... *triangularis*, Brun.
Wings not yellowish at the base; abdominal tergites without black apical triangles .... 52.

52. Abdomen black; third and fourth segments mainly yellowish. (India.).... *caliginosa, Brun.
Abdomen mainly brownish. (India.) .. *testacea, Brun.

53. Thorax shining. (Sierra Leone.) ...... *leonensis*, Alex.
Thorax dull .... 54.

54. Præscutum black. (Formosa.) .... *rubriceps*, Edw.
Præscutum orange, with three black stripes. (Ceylon.) .... *scutellata*, Edw.

55. Thorax wholly red. (Singapore.)...... *plecioides* (Walk.).
Thorax wholly black .... 56.

56. Four posterior cells (the number is not stated in the description, but must be four, since Osten-Sacken refers to the bases of the second and third being nearly in a line). (Celebes.) .... *morosa, O.-S.
Five posterior cells .... *lygropis*, Alex.

57. Wing-markings at the tip only; four posterior cells........................ 58.
Wings with distinct median pale markings .... 70.

58. A single white spot at the extreme tip of the wing.......................... 59.
Three white spots round the wing-tip (one large, two small). (Ceylon.) .... 65.

59. Costal region broadly orange, except towards base and apex. (India.) ...... *flavicosta*, sp. n.
Costal region all dark .... 60.

60. Abdomen and thorax chestnut-brown, 5th and 6th segments largely yellow. (India.) .... **elongatissima*, Brun.
Abomen otherwise .... 61.

61. Thorax entirely velvet-black .... 62.
Thorax not entirely black .... 64.

62. Femora yellow with black tips; abdominal segments 2–5 nearly all yellow; 6 yellow at base. (Java.) .... *albipunctata*, Wulp.
Legs all black; abdominal segments 2–5 with broad apical black bands. (S. India.) 63.

63. Sixth abdominal segment entirely black. *kempi*, Brun.
Sixth abdominal segment yellow at the base .... *kempi*, var. n. *longior*.

64. Thorax mahogany-brown; præscutum with three blackish stripes. (India.) . **tenuis*, Brun.
Thorax ash-grey, præscutum with four black stripes. (India.) .... **pulchrithorax*, Brun.

65. Abdomen velvet-black, with broad shining blue-black bands; legs black, stout. 66.
Abdomen not all black, mainly dull; femora mostly yellowish; legs more slender .... 67.

66. Thorax entirely red; legs very stout .. *ctenophoroides*, Edw. [(=*rufithorax*, Brun.).
Thorax entirely blackish brown; legs not quite so stout .... *ctenophoroides*, var. n. [*nigrithorax*.

67. Basal halves of abdominal segments 2–4 shining; thorax brown .... *badia*, Brun.
Abdominal segments 2–4 entirely dull, or uniformly and slightly shining .... 68.

68. Abdomen entirely brownish; slightly shining .... *greenii*, Brun.
Abdomen dull, basal segments yellow .. 69.

69. Thorax and apex of abdomen velvet-black; femora with black tips .... *albonotata*, Lw.
Thorax and apex of abdomen brownish; femora all yellow .... *albonotata*, var. n. [*citrocastanea*

70. Wings with a transverse pale central fascia or spot; apical fourth all dark.. 71.
Wings with pale central markings, and also with pale markings at the tip or in the apical fourth .... 88.

71. Abdomen with leaden or bluish-white bands; four posterior cells .... 72.
Abdomen without leaden or bluish-white bands .... 80.

72. Wing-markings faint; body wholly blackish. (Siam.) .... *robinsoni*, sp. n.
Wing-markings conspicuous .... 73.

73. Several distinct white spots about the middle of the wing, in addition to the fascia. (Himalayas.) .... **decorata*, Brun.
Wings with a whitish central fascia only. 74.

74. Base of wing conspicuously yellow, often also the costa to a large extent ...... 75.
Base of wing not yellow .... 78.

75. Cross-vein *r* vertical, far beyond base of R_2. (Sumatra.) .... *_sumatrensis_, Macq.
Cross-vein *r* very oblique, close to or even before base of R_2 .... 76.

76. Flagellum and legs yellow; head dark brown; frontal tubercle simple; central fascia reaching hind margin. (Assam.) *assamensis*, sp. n.
Flagellum and legs dark; head velvet-black; frontal tubercle divided; central fascia rarely reaching hind margin.... 77.

77. Male abdomen with segments 3–5 elongate, shining black at the base, pale bluish grey in the middle, velvety-black at the tip. (India.) .... *nepalensis*, Westw. (=*velutina*, Walk.).
Male abdomen with segments 3–5 much shorter, without bluish-grey bands in the middle. (W. China.) .... *sinensis*, sp. n.

78. Dorsum of thorax orange. (Tonkin, Assam.) .... *_fenestrata_, Brun.
Thorax black or dark grey .... 79.

79. Thorax grey with black stripes, legs mainly yellow. (India.) .... *flavipes*, Brun.
Thorax entirely black, somewhat shining; legs blackish. (Hong Kong; Japan.) *hilpa*, Walk. (=*albo-guttata*, Mats.).

80. Abdomen entirely dull black; four posterior cells. (India.) .... *_nigerrima_, Brun.
Abdomen not entirely dull black ...... 81.

81. Four posterior cells; apex of abdomen shining. (Philippines.) .... 82.
Five posterior cells .... 83.

82. Hind legs normal; abdomen dilated, with yellowish bands near base .... *_lativentris_, Bezzi.
Hind legs thickened; abdomen not dilated, entirely black .... *_crassipes_, Bezzi.

83. Thorax reddish; legs mainly yellow. (Java.) .... *mesopyrrha*, Wied.
Thorax black or blackish brown........ 84.

84. Femora and tibiæ yellow with black tips. (Philippines.)..................... *perennis*, O.-S.
Legs black .... 85.

85. Wings yellow at base .... 86.
Wings dark at base..... .... 87.

86. Second, third, and ninth abdominal segments orange, rest black. (Sumatra.) . *bicolor*, Mcq.
Abdominal segments 2–5 orange with broad black hind margins. (Java.) .. *_cingulata_, Meij.

87. Abdomen orange on basal half; central fascia reaching hind margin. (Sumatra.) *pyrrhomesa*, Edw.
Abdomen with one or two yellow cross-bands near base; central fascia not reaching hind margin. (Philippines.) . *_mansueta_, O.-S.

88. Five posterior cells; abdomen with grey bands; wings with white spot at the tip, central spot divided .... 89.
Four posterior cells .... 95.

89. Basal half of wing entirely yellow. (Hong Kong.) .... *chrysomela*, sp. n.

	Basal half of wing not entirely yellow; two white spots in the middle	90.
90.	Costal border yellow; femora yellow with black tips..................	91.
	Costal border dark.................	92.
91.	Thorax with short pubescence; grey bands of abdomen over black ground-colour. (Himalayas.)..............	*plumbicincta*, Brun.
	Thorax with long pubescence; grey bands of abdomen over yellow ground-colour. (Assam.)	*plumbolutea*, sp. n.
92.	Thorax black, except for the yellowish scutellum	*trimaculata*, sp. n.
	Front of mesonotum red	93.
93.	Femora yellow with black tips. (Himalayas.)	*_cincta_, Brun. (*cingulata*, Brun., nec Meij.).
	Legs black	94.
94.	Scutellum and postnotum blackish. (Himalayas.)	*gravelyi*, Brun.
	Scutellum and postnotum orange. (Assam.)	*brunettii*, sp. n.
95.	Black species; wing-markings all yellowish; a pale spot near base of inner marginal cell, which does not spread out into the upper basal	96.
	Not with all the above characters	97.
96.	A small yellowish spot at wing-tip; membrane partly iridescent. (Sumatra.)	*_gamma_, End.
	* Wing-tip dark; membrane not iridescent. (Formosa)	*sauteriana*, End.
97.	Apical wing-marking just before the tip.	98.
	Apical wing-marking at the extreme tip.	101.
98.	Wings with additional white markings more basal than the central fascia ..	99.
	Wings with only the central fascia and a more or less oval spot near the tip white.	100.
99.	Thorax black; base of wing yellow. (Java.)	*basilaris*, Wied.
	Thorax yellowish brown to dark brown; base of wing dark. (Sumatra.)	*_pannosa_, End.
100.	Wing-base and costal cell yellow; halteres yellow. (Borneo.)	*infixa* (Walk.).
	Wing-base dark; halteres black. (Borneo.)	*borneana*, sp. n.
101.	Several white spots round wing-tip....	102.
	A single white or yellow spot at wing-tip.	103.
102.	Thorax black; wings darker anteriorly. (Tenasserim.)	*_rufibasis_, Brun.
	Thorax reddish brown; costal cell yellowish. (Borneo.)..............	*combinata* (Walk.) (=*dilula*, Walk.).
103.	Thorax with three brightly shining stripes. (Borneo, Java.)	*lunigera* (Walk.) (=*optabilis*, Walk.).
	Thorax entirely dull	104.
104.	Abdomen black, the tergites shining basally	105.
	Abdomen partly orange, dull	106.
105.	Cu_1a at tip of discal cell; thorax red. (Sumatra.)	*_selene_, O.-S.

	Cu$_1$a before tip of discal cell; thorax dark reddish brown. (Borneo.)	_leucotela_ (Walk.).
106.	Abdomen with a median blackish-brown longitudinal stripe. (Java; Bengal.)	_acrostacta_, Wied.
	Abdomen without such stripe	107.
107.	Thorax and last two abdominal segments black, rest reddish. (Java.)	*_javensis_, Dol.
	Thorax reddish brown	108.
108.	Femora and tibiæ all yellowish. (Bengal.)	*_diana_, Macq.
	Femora and tibiæ with black tips. (Sumatra.)	_klossi_, Edw.

The Hypopygial Structure.

The hypopygium of *Eriocera*, which is in general similar to that of many Limnophilinæ, shows a number of interesting features. For the most part the terms employed in the descriptions are those used by me for the Culicidæ (see 'Annals of Tropical Medicine and Parasitology,' xiv. 1920, pp. 23–40). There are, however, important differences between the two families, and in some respects it is difficult to homologise the parts, so that a full description of the general type of structure in *Eriocera* will be useful to make clear the descriptions and figures. It is necessary to state first that in *Eriocera* there is no torsion of the ninth and tenth abdominal segments.

The *ninth tergite* is well developed and usually of quite simple structure, sometimes produced or emarginate in the middle, but never with conspicuous developments. It is impossible to detect any line of division between the ninth tergite and ninth sternite—in fact, the tergite may perhaps be regarded as forming a complete ring, and the sternite as absent altogether. That this may be the true state of affairs is shown by the traces of a suture in the mid-ventral line which can sometimes be detected. This is the normal condition in the Limnophilinæ, but it may be noted that in one or two Limnophiline genera (e. g., *Phyllolabis*) a small separate ninth sternal piece is present, which may or may not represent the true ninth sternite in an obsolescent condition.

The *side-pieces* are well developed, tubular, usually simple, but occasionally with basal lobes. There are two pairs of *claspers* (*outer* and *inner*), which in many cases are incompletely separated, indicating clearly that the inner pair has arisen as a development from the base of the outer (or *vice versa*). The outer clasper is strongly chitinised, more or less bare, with a sharp-pointed, often hooked tip, but without terminal spine. The inner clasper is fleshy, hairy, and has on its outer surface a groove into which the outer clasper fits. The two pairs articulate together at the tip of the side-piece, and are movable in a horizontal plane.

The *tenth* (*anal*) *segment*, as in most Limnobiidæ, is a spicular tube of tough membrane, usually entirely devoid of chitinisation and retracted beneath the ninth tergite. Very rarely a pair of small tergites bearing a few bristles are present. I have seen no indications of cerci, though in some Limnophilinæ these are represented by terminal papillæ.

The *ædœagus* (see text-fig. 2, **h**) is highly chitinised and complicated, and is probably in a much more generalised condition than that of the Culicidæ. In the main, the general conception of the genital tube given by Sharp and Muir for the Coleoptera (Trans. Ent. Soc. London, 1912, p. 602, fig. 239) will fit that of *Eriocera* very well. The main differences lie, firstly, in the fact that in *Eriocera* the mesosome (median lobe) is permanently invaginated, and, secondly, that there is a strong chitinisation of part of the "first connecting membrane" between the mesosomal and tegminal rings of the genital tube.

On the dorsal side of the ædœagus, continuous, on the one hand, with the second connecting membrane (at the base of the tenth segment) and, on the other hand, with the tubular penis, is a large chitinous structure, whose homologies are somewhat uncertain. It might be possible to regard it, or part of it, as the tenth sternite, and its appendages as anal cerci, but from the fact that it never bears any bristles, also because it is in contact or fused laterally with the basal plates, I think it must certainly be regarded as part of the tegminal ring of the genital tube. This is also indicated by its readiness to take up stain, quite unlike the chitinisations of the body-wall, but agreeing in this respect with the rest of the genital tube. It bears a pair of processes (*parameres*), which in their free portion are very variously constructed; at the base these processes spread out, and are fused laterally with processes from the base of the side-pieces and medially with one another. The median fused portion forms a strong bar connecting the bases of the side-pieces, and extends almost vertically downwards to the base of the penis; in the dorsal portion of this median structure there are distinct traces of fusion, but none at all in the ventral portion. The pair of processes are undoubtedly homologous with the gonapophyses of de Meijere and others, which I have elsewhere identified with the parameres; this identification is possibly incorrect, since in the Culicidæ the parameres are articulated definitely with the basal plates, and are ventral rather than dorsal to the mesosome. However, if we regard both organs as belonging to the tegminal ring of the genital tube (which seems most probable) there can be no great obligation to using the same name in each case. A name is required for the unpaired median portion. It cannot be called the tegmen, since this term has been used by Sharp and Muir for "the lateral lobes [parameres] and basal piece together," while in the present case the basal plates are distinct structures. I propose the term *dorsal plate*, in default of a better.; it seems to be the analogue of the ventral plate described by Sharp and Muir in the Scarabæidæ, which is also fused with the parameres, and morphologically on the dorsal side of the tube.

The *basal plates* are well developed, and obviously homologous with those of the Culicidæ. They are usually in the form of two distinct latero-ventral plates, but are sometimes connected in the mid-ventral line by a narrow bridge of chitin; in one species (*E. semilimpida*) this bridge is quite broad. From this condition it is easy to imagine a transition to a state in which the basal plate forms an unpaired ventral piece. In the species mentioned the connecting bridge is external, the mid-ventral portion of the second connecting membrane not being invaginated.

Distal to the dorsal and basal plates, and connected with them by a short straight membrane, is a complete ring of chitin, generally tubular in form, but varying greatly in length in the different species. Although it is possibly the homologue of the mesosome of the Culicidæ, it is certainly not the same as the median lobe of Sharp and Muir, since the membrane connecting it with the dorsal and basal plates is very short and not at all invaginated; it may best be regarded rather as a distal tubular portion of the tegminal ring, such as has been noted by Sharp and Muir in certain Coleoptera. It is the organ called the penis by de Meijere and others, and, though this term is not free from objection, I propose to retain it provisionally; Snodgrass's term "penis-guard" would be equally appropriate.

At the tip of the penis is a small circular opening, from which the genital tube is continued backwards as a thin-walled tube (lying within the penis) as far as the base of the penis, or a little farther; it then enlarges again into a chitinous body, which is provided with a conspicuous apodeme extending towards the interior of the body. At the base of this apodeme is a hole in the sac, which probably marks the point at which the membranous portion of the genital tube (*stenazygos*) enters the chitinised sac. The apodeme seems to be analogous to, though it may not correspond morphologically with, the median strut of Sharp and Muir. It is most developed in those species with a short penis. It seems probable that this chitinised sac corresponds rather with the median lobe than with the internal sac of the Coleoptera. In that case, the slender tube connecting the sac with the tip of the penis must be regarded as the permanently invaginated distal portion of the first connecting membrane, and the penis itself as a special chitinisation of the proximal portion of this same "membrane."

Descriptions of new Species and Varieties.

1. *Eriocera yerburyi*, sp. n., ♂.

Head ochreous, the proboscis, scape of antennæ, and basal joint of palpi of the same colour; rest of palpi, and flagellum of antennæ except base of first joint, blackish. Frontal tubercle very large, simple. First scapal joint considerably swollen, about twice as long as broad. Flagellum four-jointed, a little more than twice as long as the thorax; numerous bristly hairs on the underside. Fourth joint of palpi about as long as the two preceding together; first joint a little shorter than the fourth. *Thorax* dull blackish, with a slight grey dusting; præscutum with two grey stripes and a median grey line faintly indicated. Pubescence yellowish, short and sparse. *Abdomen* uniformly blackish brown, shining, about twice as long as the thorax. *Hypopygium*: ninth tergite with a broad V-shaped terminal emargination. Side-pieces simple, nearly cylindrical, but somewhat curved, about 2·5 times as long as broad. Outer clasper without long hairs, finely pubescent at the base and on the inner side a little before the tip, which is rather suddenly narrowed but gently curved. Inner clasper broad, hairy, with deep groove for reception of outer clasper, separated from the latter down to the extreme base; tip somewhat produced inwards. Parameres bilobed; dorsal lobe conical, sharply pointed; ventral lobe broad, somewhat narrowed towards the rounded tip. Dorsal plate slightly emarginate apically. Penis much shorter than the mesosome, broad at the base, terminating in two long points. *Legs* rather long and slender, dark brown, extreme tips of all joints black. Claws with small basal tooth; empodium nearly as long as the claws. *Wings* light brown, veins and stigma darker. Sc ending distinctly beyond apex of Rs.

Tip of R_1 a little longer than *r*. R_{2+3} and R_2 about equal in length and nearly in a straight line; *r–m* less than its own length from base of R_{4+5}. Cu_1a reaching M_{3+4} at one-fifth of discal cell, which is not quite twice as long as broad. Cu_2 straight, shorter than Cu_1a and forming an angle of 120° with it. Distance from tip of Ax to tip of An about equal to that between Cu_2 and Cu_1, and nearly three times that between Cu_2 and An. *Halteres* yellowish with black tips.

Length of body 8 mm.; wing $10 \times 2{\cdot}6$ mm.

CEYLON: Haragam, 1. vi. 1892, 1 ♂ (*Lt.-Col. Yerbury*).

2. *Eriocera stricklandi*, sp. n., ♀.

Head dull blackish grey; sides of frontal tubercle ochreous; pubescence blackish, short but rather dense. Frontal tubercle simple, rather large and projecting. Antennæ entirely black, fully as long as the head and thorax together; first scapal joint about four times as long as broad. Flagellum with the three basal joints distinct, third a little longer than the second, but shorter than the first; five joints, apparently, in the terminal portion. Palpi black; second joint much longer than the first or third and nearly equal to the fourth. *Thorax* greyish ochreous, with a moderately long and rather dense ochreous pubescence. Præscutum with three broad slightly shining blackish-brown stripes, the side-stripes continued across the scutum. Lower half of pleuræ, also the coxæ, whitish grey. *Abdomen* dull ochreous-orange, the first four tergites and the apex of the fifth dark brown. *Ovipositor* long and almost straight, the cerci much stouter than is usual in the genus. *Legs* ochreous, tarsi rather darker; all tibiæ with black tips; front and middle femora rather broadly black at the tips; hind femora black, except on the basal fifth. Claws simple, twice as long as the broad empodia. *Wings* ochreous-tinged, costal cell yellower, stigma distinct, but rather ill-defined, blackish; veins mostly ochreous. Sc ending midway between base of R_2 and *r*; tip of R_1 slightly upturned, a little longer than *r*; R_2 quite four times as long as R_{2+3}; *r–m* more than twice its length from base of R_{4+5}; cell M_1 present, shorter than its petiole; discal cell not much longer than broad; Cu_1a at about one-third of discal cell; Cu_2 curved, at right angles with Cu_1a at base. *Halteres* ochreous.

Length of body 30 mm.; wing 21×6 mm.

JAPAN: (no exact data), 1909 (*T. A. G. Strickland*).

3. *Eriocera waterstoni*, sp. n., ♀.

Head blackish grey, dull, nearly bare; frontal tubercle small but distinct, simple. Scape of antennæ black, the first joint a little over twice as long as broad; flagellum missing. Palpi black; second joint swollen but elongate, much longer than the first or third, and a little longer even than the fourth. *Thorax* dull blackish grey; a whitish line on the extreme margin of the mesonotum; above this, just in front of the wing-base, a short velvet-black stripe. Upper half of the pleuræ deep black, shining except in places; lower half heavily dusted with whitish grey. *Abdomen* black, somewhat shining; ovipositor slender, reddish. *Legs*: front coxæ blackish, the others ochreous, all grey-dusted; trochanters ochreous; remainder of legs missing. *Wings* uniformly blackish. Venation like that of *E. chirothecata* (as figured by Kuntze, 1913), except that Cu_1a is hardly beyond the middle of the discal cell, and the distance between the tips of Ax and An is over twice that between An and Cu_2. *Halteres* black.

Length of body 13 mm.; wing 12 × 3·2 mm.

MACEDONIA: Rendino Gorge, vi. 1918 (*Capt. J. Waterston*).

The venation is very similar to that of *E. schnusei*, Kuntze; probably, as in that species, the tarsi are dark, but confirmation of this point is required.

4. *Eriocera umbripennis*, sp. n., ♀. (Pl. X. fig. 2.)

Head black, with some rather long black bristly hair; frontal tubercle rather small, triple, a single conically produced upper division, two more rounded tubercles just above base of antennæ. Antennæ black, slightly longer than the thorax; first scapal joint about three times as long as broad; flagellum with the first four joints distinct, gradually diminishing in length; terminal portion scarcely equalling the preceding three joints together. Palpi with the four joints about equal in length, each roughly four times as long as broad. *Thorax* purplish black; præscutum with five deeper black stripes, the three middle ones narrow; pubescence black, rather spare and short. *Abdomen* with the four basal segments dull orange, the rest velvet-black; valves of the ovipositor elongate, slender, reddish. *Legs*: coxæ, trochanters, and middle femora black (rest missing). *Wings* uniformly black. Sc_1 ending opposite *r*; Sc_2 opposite base of R_2; *r* more than three times its length from tip of R_1;

r–m nearly twice its length from base of R_{4+5}; cell M_1 present, a little longer than its petiole; Cu_1a just beyond middle of discal cell; Cu_2 short, curved; distance Ax–An on wing-margin not much longer than An–Cu_2, and distinctly shorter than Cu_2–Cu_1. *Halteres* black.

Length of body 21 mm.; wing 15 × 4·2 mm.

Penang: no further data (*H. N. Ridley*), 1 ♀.

5. *Eriocera shirakii*, sp. n., ♂.

Head velvet-black, pubescence black, rather long; frontal tubercle moderate, simple. Antennæ black, rather less than twice as long as the thorax; first scapal joint small, very little longer than broad; flagellar joints regularly diminishing in length, the fourth rather more than half as long as the first. Palpi black; first and second joints about equal in length, third considerably shorter, fourth half as long again as the second. *Thorax* velvet-black; pubescence black, long and dense; præscutum with four rather narrow, slightly shining stripes. *Abdomen* with segments 1, 6, 7, and 8 entirely velvet-black, 2–5 and 9 entirely orange. *Hypopygium*: ninth tergite emarginate. Side-pieces simple, somewhat narrowed towards the tips, nearly three times as long as broad. Outer clasper with a few long hairs towards the base, abruptly narrowed a little before the tip, which is bent inwards and hook-like. Inner clasper moderate, separated from the outer almost to the base. Parameres bilobed, dorsal lobe curved, pointed; ventral lobe larger than the dorsal, long-conical, the sharply pointed apex projecting inwards. Dorsal plate entire. Penis as long as the mesosome, straight, pointed, bare. *Legs* black, somewhat shining, moderately stout. Claws with strong basal tooth, twice as long as the empodium. *Wings* uniformly blackish, anal and axillary cells somewhat lighter. Sc ending opposite base of R_2; *r* over twice its length from tip of R_1; R_2 over twice as long as R_{2+3}; *r–m* nearly twice its length from base of R_{4+5}; cell M_1 absent; Cu_1a just before middle of discal cell; Cu_2 curved, not much shorter than Cu_1a. Distance Ax–An on wing-margin just over twice An–Cu_2. *Halteres* black.

Length of body 13 mm.; wing 12 × 3·8 mm.

Formosa: Koshun, 25. iv.–25. v. 1918 (*J. Sonan*, *K. Miyake*, and *M. Yoshino*), 1 ♂, presented to the British Museum by Dr. T. Shiraki.

It is possible that this may be the male of *E. rubriceps*, Edw.

6. *Eriocera flavicosta*, sp. n., ♀. (Pl. X. fig. 4.)

Head black, with black bristly hair; frontal tubercle small, divided into two by a transverse furrow. Antennæ with the first three flagellar joints light brown, rest black. First scapal joint above three times as long as broad; flagellum 8-jointed, the joints gradually decreasing in length. Palpi black, rather stout, first joint a little longer than the others, which are all about equal in length. *Thorax* dull black, without distinct markings; pubescence dark, moderately short and spare. *Abdomen* with segments 1, 5, 6, 7, and sides of 4 black; 2, 3, 8, middle of 4, and ovipositor orange. *Legs* ochreous-brown; coxæ, trochanters, tips of femora and tibiæ, and terminal tarsal segments black. Claws simple; empodium very short and broad. *Wings* brown, darker on the apical third; the costal and inner marginal cells yellow; a distinct white spot at the tip, including the tips of R_3 and R_{4+5}. Sc ending opposite base of R_2; *r* scarcely twice its length from tip of R_1; R_3 a little over twice as long as R_{2+3}; *r–m* below the base of R_3; Cu_1a near apex of discal cell; Cu_2 short, slightly curved; distance Ax–An on wing-margin about three times An–Cu_2. *Halteres* black.

Length of body 26 mm.; wing 18 × 5 mm.

India: Nilgiri Hills, 3000 ft., 21. viii. 1888 (*Sir G. F. Hampson*), 1 ♀.

7. *Eriocera kempi*, Brun., var. n. *longior*.
(Pl. X. fig. 5.)

Differs from *E. kempi*, Brun. (as represented by a paratype in the British Museum), as follows:—*r-m* longer, not shorter than *r*; upper of the two veins closing the discal cell half as long as the lower (in *E. kempi* paratype the upper is obliterated); Cu_1a well before, not at the tip of the discal cell; no minute clear spot in cell Cu_1; two-thirds of abdominal segments 4 and 5 orange, these segments also being longer in proportion to their breadth; a large orange spot at the base of the sixth tergite; outer claspers of hypopygium with a deeper preapical notch.

Length of body 28 mm.; wing 21 × 5 mm.

India: Mt. Hamilton, 2 ♂.

8. *Eriocera ctenophoroides*, Edw., var. n. *nigrithorax*, ♀.

Differs from *E. ctenophoroides*, Edw., as follows:—First joint of flagellum distinctly longer and more slender, scarcely any thicker than the second joint (in *E. ctenophoroides* it is distinctly thicker); thorax and last abdominal segment velvet-black; middle segments of abdomen extremely broad, quite twice as broad as the base and considerably broader than in the type female of *E. ctenophoroides*; legs stout, but considerably less so than in the type, the femora and tibiæ being also distinctly longer.

Ceylon: Pallamadulla, 17. vi. 1892, 1 ♀ (*Lt.-Col. Yerbury*).

I referred to this specimen in describing *E. ctenophoroides* in 1911. The difference from the type is not confined, as I then thought, to the black thorax, and the specimen evidently represents a distinct variety if not species.

9. *Eriocera albonotata*, var. n. *citrocastanea*.
(Pl. X. fig. 6; text-fig. 2 f.)

Differs from the typical form as follows:—Thorax and dark parts of the abdomen dark chestnut-brown, not black; fifth abdominal segment of male longer and entirely dark; femora without black tips; hypopygium rather light brown; side-pieces longer (quite 1·5 times as long as their breadth at the base); penis longer (about 4 times instead of 2·5 times as long as its breadth at the base); preapical notch of outer clasper much less distinct.

Length of body, ♂, 23 mm.; wing, ♂, 17 × 4·8 mm.

Length of body, ♀, 25 mm.; wing, ♀, 19 × 5 mm.

Ceylon: Passara, 6. vi. 1897 (*Lt.-Col. Yerbury*), 1 ♂; Pundaluoya, v. 1889 (*E. E. Green*), 1 ♀.

10. *Eriocera robinsoni*, sp. n., ♀. (Pl. X. fig. 3.)

Head dull blackish grey, with numerous black bristles; antennæ and palpi dark brown. Frontal tubercle moderate, simple. First scapal joint more than three times as long as broad. Flagellum six-jointed, first two joints together longer than the remaining four. Palpi rather short and stout, first joint a little longer and more slender than the remaining three, which are subequal. *Thorax* dull dark brown, unmarked. *Abdomen* velvety-black, rather damaged, but apparently with shining bands at the bases of the tergites. *Legs* uniformly blackish; claws simple; empodia short and thick. *Wings* rather strongly infuscated; a large but inconspicuous pale area in the middle extending across the inner marginal and basal cells, but not quite reaching R_1 or Cu. Sc ending just beyond base of R_2; *r* about three times its length from tip of R_1; R_2 more than three times as long as R_{2+3}; four posterior cells; Cu_1a near apex of discal cell; Cu_2 as long as Cu_1a, slightly curved; distance Ax–An on margin about twice An–Cu_2. *Halteres* black.

Length of body 14 mm.; wing 11×3·3 mm.

SIAM: Bukit Besar (*H. C. Robinson* and *N. Annandale*), 1 ♀.

11. *Eriocera assamensis*, sp. n., ♀.

Head dark greyish brown, with rather long and dense black hair. Frontal tubercle moderate, simple. First scapal joint dark greyish brown, four times as long as broad; second scapal and first three flagellar joints yellow, tip of flagellum dark. Flagellum with nine joints, the last six all rather short. Palpi black, moderately long; first and fourth joints each a little longer than the second or third, second a little thicker than the others. *Thorax* velvet-black, pleuræ with a slight brown tinge. *Abdomen* velvet-black, without shining areas; second, fourth, and fifth tergites with broad whitish-grey basal bands. Ovipositor reddish, but the segment bearing it black. *Legs* yellow; coxæ, trochanters, tips of femora and tibiæ, and the greater part of the tarsi blackish. Claws simple; empodia short and broad. *Wings* blackish; base bright yellow; a broad white fascia in the middle, extending from R_1 to the hind margin. Sc_1 extending well beyond the base of R_2; Sc_2 far before the tip of Sc_1; *r* very oblique, four or five times its length from tip of R_1, its middle joint above the base of R_2; R_2 quite four times as long as R_{2+3}; *r–m* below base of R_2; four posterior cells; Cu_1a near the tip of the rather short discal cell; Cu_2 curved, shorter than Cu_1a; distance Ax–An on the margin not quite twice An–Cu_2. *Halteres* black.

Length of body 17 mm.; wing 14×4·2 mm.

ASSAM: Khasi Hills (purchased from *E. Heyne*), 1 ♀, taken together with typical specimens of *E. nepalensis*.

12. *Eriocera sinensis*, sp. n., ♂. (Text-fig. 2 d.)

Head velvet-black, with black hair. Frontal tubercle divided by a transverse furrow, the lower portion somewhat more prominent than the upper. Scape of antennæ black, the first joint about four times as long as broad; flagellum missing. Palpi black; first and fourth joints slightly longer than the second and third, second distinctly thicker than the others. *Thorax* velvet-black. *Abdomen* considerably shorter than the wings; velvet-black, the second, fourth, and fifth tergites with broad leaden basal bands, somewhat more shining basally than apically; a narrow shining leaden band at the base of the third tergite. *Hypopygium*: side-pieces simple, about twice as long as their greatest breadth. Outer claspers with small but deep preapical notch. Middle third of ninth tergite prominent, with median emargination. Parameres rather broad, somewhat pointed, dorsal lobe represented only by a small backwardly projecting tooth. Penis, if straight, would be almost as long as the side-piece, but is bent downwards and backwards about the middle. *Legs* black. Claws with basal tooth; empodia about half as long as the claws. *Wings* black, bright yellow at the base; anal and axillary cells lighter; a white median fascia of almost even width extending from R_1 almost to the hind margin. Sc_1 ending immediately before base of R_3; Sc_2 scarcely beyond base of R_{2+3}; venation otherwise almost the same as in *E. assamensis*. *Halteres* black.

Length of body 12 mm.; wing 12×3·8 mm.

W. CHINA: Golden Buddha Mt., N. of Changking, Sze-Chuen Province, 5000 ft., 15. viii. 1907 (*W. A. Maw*), 1 ♂.

Evidently closely allied to *E. nepalensis*, but certainly distinct. The hypopygium of *E. nepalensis* differs from that of *E. sinensis* as follows:—the ninth tergite is not prominent in its middle third; the preapical notch on the outer clasper is less marked; the side-piece is somewhat shorter and stouter; and the penis is shorter and more pointed.

13. *Eriocera chrysomela*, sp. n.
(Pl. X. fig. 7; text-fig. 2 a.)

Head velvet-black, with a pale grey central longitudinal line, and with black hair. Frontal tubercle divided into three parts, the upper portion rounded, only very slightly prominent, the lower portion produced into two conspicuous tubercles. Antennæ black; first scapal joint about three times as long as broad; first flagellar joint half as long again as the second, which is half as long again as the third; terminal portion about as long as the first joint, without definite jointing in the male, but with six rather indistinct joints in the female. Palpi black, moderately long; fourth joint almost as long as the second and third together; first not quite as long as the fourth; second somewhat thicker than the others. *Thorax* uniform velvet-black or very dark brown; pubescence sparse and not very long. *Abdomen* velvet-black; basal halves of tergites 2–5 shining blackish; beyond the shining area is a rather narrow transverse leaden-grey band on each of the segments

2–5; hypopygium, ovipositor, and the segment bearing the ovipositor orange. *Hypopygium*: ninth tergite with the central portion strongly produced, but emarginate in the middle. Side-piece less than twice as long as its basal diameter, much narrower apically; at the base on the ventral side with a rounded prominence bearing a row of about 15–20 short spines. Outer clasper bare, with a deep excavation on the outer side near the base, preapical notch small. Inner clasper rather narrow, incompletely separated from the outer. Parameres rather long, straight, with rounded tips, no basal tooth. Penis (if straightened) would be a little longer than the side-pieces, but is bent downwards and backwards about its middle; both halves are strongly curved; the outer (ventral) half bears numerous short bristly hairs, which are most dense at the tip; on the outer side of the bend is a deep groove, tip not much thinner than base. *Legs* long, slender, black; claws of the male with basal tooth, not much longer than the narrow empodium: of the female simple, empodium short and broad. *Wings* blackish at the extreme base, beyond which rather more than half of the wing is yellow; anal and axillary cells lighter. At the outer edge of the yellow area is a clear whitish spot extending across the basal cells but not reaching Rs or Cu. The apical part of the wing, from the tip of Sc to the tip of Ax, is blackish brown, except for the tip, which is rather broadly pure white. Sc ending opposite *r*, which is about three times its length from the tip of R_1, and not quite its own length from the base of R_2; R_2 more than three times as long as R_{2+3}; *r–m* below base of R_2; cell M_1 present, more than twice as long as its stalk; Cu_1a close to apex of discal cell; Cu_2 slightly curved. *Halteres* black.

Length of body, ♂, 13 mm.; wing, ♂, 12 × 3·7 mm.
Length of body, ♀, 21 mm.; wing, ♀, 15 × 5 mm.
HONG KONG (*J. C. Bowring*, 1861), 1 ♂, 1 ♀.

14. *Eriocera plumboluteu*, sp. n., ♂. (Text-fig. 2 c.)

Head velvet-black, with long and dense black hair. Frontal tubercle triple, the pair of tubercles above the antennæ rather small, but slightly larger than the unpaired and more rounded dorsal tubercle. Antennæ with the scape blackish, first joint about three times as long as broad; first three flagellar joints yellow (remainder missing). Palpi black (damaged). *Thorax* entirely velvet-black, except for the prothoracic lobes, which are reddish and rather more prominent than usual. Sides of mesonotum with long and dense black hair; præscutum also with long black hair along the furrows. *Abdomen*: segments 1 and 6–8 entirely velvet-black, 2–5 with yellow ground-colour, dusted over with grey, more shining basally, apical fifth of each velvet-black. *Hypopygium* orange-yellow. Ninth tergite with its middle portion strongly produced, emarginate in the middle, rather densely hairy. Side-pieces about twice as long as their breadth at the base; an irregular row of about 20 short blunt spines at the base beneath, not situated on a definite prominence. Outer clasper bare, slightly thickest in the middle, without distinct excavation on outer side near base; preapical notch slight. Inner clasper broad, incompletely separated from the outer. Parameres with a trace of a basal tooth; long, nearly straight, with rounded tips. Penis with a thick, nearly straight basal portion which is nearly as long as the side-piece, then bent downwards and backwards for about half the length of the basal portion, then forwards again as a slender bare filament which is nearly as long as the basal portion. *Legs*: coxæ and trochanters black; femora yellow with black tips; tibiæ brownish with black tips; tarsi blackish; claws with small basal tooth; empodia short. *Wings* with dark brown ground-colour; yellow at the base and in the whole of the costal and subcostal cells; a large nearly square white spot near the tips of the basal cells, extending from Rs to Cu; a small white spot in the inner marginal cell just above the fork of Rs; a very small white spot on the extreme tip, just including tips of R_3 and R_{4+5}. Sc ending opposite *r*; Sc_2 much before tip of Sc_1; *r* rather long, vertical, twice its length before tip of R_1; R_2 nearly four times as long as R_{2+3}; cell M_1 present, more than twice as long as its stalk; Cu_1a almost at tip of discal cell; Cu_2 nearly as long as Cu_1a, slightly curved. *Halteres* black, tip greyish.

Length of body 14 mm.; wing 12·5 × 4 mm.

ASSAM: Khasi Hills (purchased from *E. Heyne*), 1 ♂.

15. *Eriocera brunettii*, sp. n., ♂. (Text-fig. 2 b.)

Head very dark ash-grey, pubescence moderate. Frontal tubercle triple, the unpaired dorsal portion very slight indeed. Antennæ black; first scapal joint about three times as long as broad; flagellum with five joints, each a little shorter than the preceding. Palpi black; first and fourth joints each about as long as the second and third together; second a little thicker than the others. *Thorax* dull orange dorsally, nearly bare; præscutum and scutum more reddish-tinged, scutellum and postnotum more yellowish-tinged. Pleuræ dark grey, passing to orange above. *Abdomen* entirely black, mostly shining; fifth and sixth segments only with narrow velvet-black apical borders (possibly the shining appearance of the basal segments may not be natural). *Hypopygium* resembling that of *E. plumbolutea,* but the short spines on the bases of the side-pieces are borne on an ear-shaped process; the outer clasper is thickest near the base, where it is finely pubescent; the inner clasper is narrower; and the penis, though at least as long, is rather differently convoluted. *Legs* black; claws with small basal tooth; empodia short. *Wings* resembling those of *E. plumbolutea,* but base and costal region dark; the large central white spot less square and not quite reaching Cu: apical white mark long, narrow, and crescent-shaped, extending from before the tip of R_2 to the tip of M_1; Cu_1a not much beyond middle of discal cell. *Halteres* black, base of stem pale.

Length of body 11 mm.; wing 10 × 3·2 mm.

ASSAM: Tura, Garo Hills, 1400 ft., 17. x. 1917 (*Mrs. S. Kemp*), 1 ♂.

The specimen was sent by Brunetti as his *gravelyi,* from which it differs in the orange scutellum and postnotum, the absence (natural?) of velvet-black bands on most of the abdominal segments, the shape of the apical wing-spot, and the position of Cu_1a. A female of *E. gravelyi* in the British Museum from Sikkim (*J. G. Pilcher*) agrees exactly with one sent by Brunetti from the Darjiling district. It seems most probable therefore that Brunetti has confused two distinct species under the name *gravelyi.*

16. *Eriocera trimaculata,* sp. n., ♀. (Pl. X. fig. 8.)

Head velvet-black, pubescence black, rather long and dense. Frontal tubercle triple, each division very small and rounded. Scape of antennæ black, flagellum yellowish, except towards the tip. First scapal joint nearly four times as long as broad. Flagellum with seven joints, the first about as long as the next two together, the last three equal in length. Palpi black, first joint scarcely as long as the second, which is much thickened, fourth as long as the second and third together. *Thorax* entirely velvet-black, except for the scutellum, which is reddish orange; pubescence rather long, black. *Abdomen* velvet-black, without shining bands, but with large pearly-white lateral basal spots on tergites 4–6. *Legs* short and stout, with long black pubescence; dark brown in colour, the coxæ and the tips of the other joints black; claws simple; empodia short. *Wings* blackish, anal and axillary cells lighter; a large central white spot extending from Rs to Cu; a second rather large white spot extending from R_1 to R_{2+3}; a third at the wing-tip, reaching from the tip of R_2 to just beyond the tip of R_{4+5}. Sc_1 ending just before *r*; Sc_2 opposite fork of Rs; *r* somewhat oblique, three times its length before tip of R_1; R_2 quite four times as long as R_{2+3}; *r–m* slightly beyond base of R_2, also slightly beyond middle of upper margin of discal cell; cell M_1 present, with extremely short stalk; Cu_1a near apex of lower margin of discal cell; basal section of M_3 very oblique; Cu_2 somewhat curved, as long as Cu_1a.

Length of body 20 mm.; wing 14·5 × 4·5 mm.

ASSAM: Khasi Hills (purchased from *E. Heyne*), 1 ♀.

17. *Eriocera borneana*, sp. n., ♀? (Pl. X. fig. 12.)

Head blackish grey, with moderately long black pubescence. Frontal tubercle triple, but only very slightly prominent. Antennæ and palpi black (tips of both missing in type). *Thorax* almost uniformly red; pleuræ only a little darker; pubescence normal, pale. *Abdomen* missing in the type. *Legs* rather short, dark brown, tarsi darker; claws simple; empodium short and narrow. *Wings* dark brown; a white fascia in the middle, extending from R_1 to Cu (at which it ends abruptly) and just touching the fork of Rs; another white spot immediately before the apex, not touching the front margin, but reaching the hind margin between R_{4+5} and M_{1+2}. Sc_1 ending opposite base of R_2; Sc_2 near tip of Sc_1; *r* vertical, about three times its length from tip of R_1; R_2 nearly four times as long as R_{2+3}; *r–m* below base of R_2; basal section of M_{1+2} (*i. e.*, inner margin of discal cell) nearly vertical; a trace of vein M_1 present (more marked in the wing figured than in the other); Cu_1a at about two-thirds of discal cell; Cu_2 slightly curved, longer than Cu_1a. *Halteres* black.

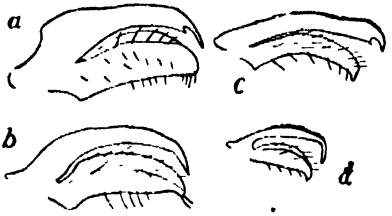
Size of wing 9 × 3 mm.

BORNEO: Kuching, Sarawak, 27. iv. 1900 (*J. Hewitt*), 1 ♀ (?). A second specimen, almost certainly belonging to the same species, is in the Cambridge Museum from Borneo (Kuching ?), 20 x.1901 (*R. Shelford*). In this specimen the first three abdominal segments and the ovipositor are yellow, the remainder of the abdomen dark. The wing differs from the type in having no trace of a pale subapical spot, and no trace of vein M_1. The size of the subapical wing-spot is probably variable, since in Walker's male type of *E. infixa* it is a mere dot, while in three females of the same species it is much larger (in all three it touches the front but not the hind margin of the wing).

REMARKS ON VARIOUS SPECIES.

1. *E. ornata* (End.), described from Sumatra, is represented in the British Museum by two males—one from Port Dixon, Malay Peninsula, 19. ii. 1908 (*G. Meade-Waldo*), and one from Kuching, Sarawak, 21. i. 1902 (*J. Hewitt*). It evidently occupies an isolated position in the genus, but there is no subgeneric name available for it, since Enderlein designated *A. verticale* as the type-species of *Androclosma*. Apart from the peculiarities of venation, the parameres of the ædœagus (text-fig. 2 i) have a unique structure; the free portion is simple, elongate, blunt-ended, and more than half as long as the side-piece. The outer clasper and the penis are constructed somewhat as in the *verticalis* group, and may perhaps indicate a connection therewith. The length of Rs is variable, being over three times as long as R in the Kuching specimen, rather shorter in the one from Port Dixon, and only twice as long as R in Enderlein's figure.

Fig. 1.



Male genital claspers of species of *Eriocera*, × 40.

a, *E. brunetti*, sp. n.; b, *E. verticalis*, Wied.; c, *E. rubrescens* (Walk.); d, *E. luteipennis* (Edw.).

2. *The Seychelles Species.*—The four species described from the Seychelles are evidently quite closely allied, as is shown by the structure of the hypopygium of three of them (*E. obscuripennis*, *E. fuscinervis*, and *E. luteipennis*) (text-figs. 1 d, 2 n, 2 o). In all these the outer clasper is regularly narrowed towards the tip, which is, however, bent inwards almost at right angles to the shaft; the parameres are bifid, the outer lobe being straight and pointed, the inner with a rounded tip; the penis is small and not distinctly separated

from the mesosome. Apart from this the species resemble one another in build, coloration, yellow scape of the antennæ, small size of frontal tubercle, short, more or less convex axillary vein, rather short Sc, short R_2, and position of *r–m* cross-vein. The apparently fundamental difference in the number of posterior cells (3 or 4) is bridged in an interesting way. A re-examination of the three specimens of *A. luteipennis* in the British Museum shows that one of them has three posterior cells (as figured by me in 1912); one has very distinctly four posterior cells and a closed discal cell; while the third has a short disconnected piece of vein M_3 present. I therefore consider the removal of *E. luteipennis* and *E. ferruginea* from *Hexatoma* to be entirely justified. The Seychelles group is a very distinct one when Old-World forms alone are considered, but the South-American *Penthoptera sanctæ-marthæ*, Alex., shows certain resemblances.

3. *The* crystalloptera *Group.*—The four Ceylon species with crystalline wings described by Osten-Sacken form another distinct group, with a number of characters in common, as indicated in the key. Three of these are represented in the British Museum, but only one of them (*E. crystalloptera*) in the male sex. The hypopygium of this species, like that of *Hexatoma*, has bilobed parameres (text-fig. 2 k), the upper lobe being bent about the middle, and a small arrowhead-like penis, but the outer clasper has the subapical notch well-marked.

4. *E. lunata*, Westw.—This is another isolated species with a striking venational peculiarity in the extremely broad upper basal cell (a point which is not sufficiently brought out by Westwood's figure) and with a very distinctive type of wing-marking. The white tip to the veins R_1 and R_3, also *r*, may indicate a connection with *E. ornata*; if that is so, the straight tip of Cu_1 could be regarded as linking *E. ornata* with the *verticalis* group. Additional characters common to *E. ornata* and *E. lunata*, and found only in these two species, are the unusual breadth of the upper basal cell and the parallelism of the basal part of Rs with R_1; neither of these points is at all indicated in *E. verticalis*. The hypopygium of Westwood's type (the only example known) is unfortunately now damaged, but Westwood figures a very peculiar structure of the claspers, and the parameres (unless broken off) are not elongate as in *E. ornata*.

5. *E. pusilla*, Alex.—In the very short, strongly upturned tip of R_1, as well as in the structure of the hypopygium and ovipositor, this species shows a greater resemblance to *Hexatoma* than to *Eriocera*, and should in my opinion be placed there. It is particularly interesting as connecting *Hexatoma*

with the *verticalis* group of *Eriocera*, and as a further instance showing the inadvisability of using the character of the number of branches of the media for generic classification in the Tipulidæ.

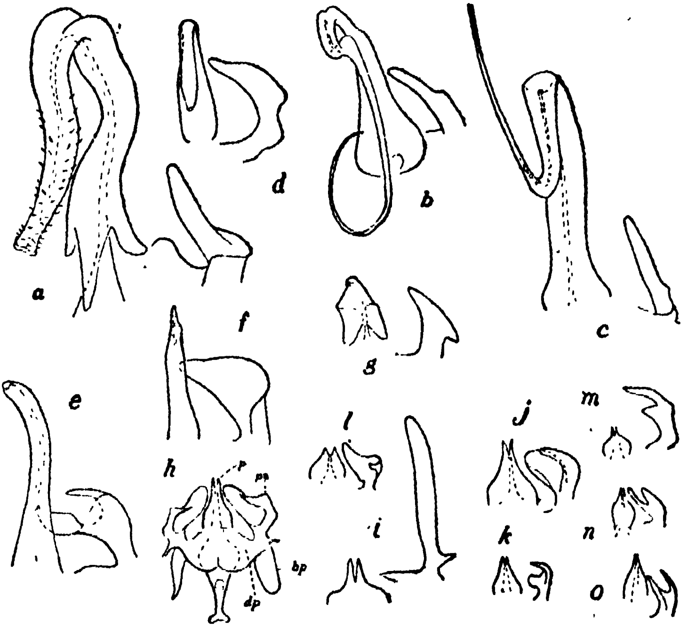
6. *The* verticalis *Group.*—This, as I interpret it, includes the thirteen species under section 12 in the key. Apart from the general similarity in coloration and venation already noted in the key, there are certain hypopygial characters common to many, if not all, of the species. The organ has been examined in six (*fusca*, *nigrina*, *nyasicola*, *tumidiscapa*, *yerburyi*, and *verticalis*), all of which show the following common features: outer clasper (text-fig. 1 b) rather gently narrowed towards the curved-down tip, no preapical notch; inner clasper broad; side-pieces simple at the base, somewhat curved; parameres bilobed, lobes about equal in length, upper lobe pointed, lower lobe very broad, with rounded tip, placed nearly in a vertical plane; penis very short, arrow-head-shaped (text-fig. 2 j). If it should be desired to accord this group subgeneric rank, the names *Androclosma* and *Globericera* are available. The South-American species of true *Eriocera* (including the type of the genus, *E. nigra*, Macq.) approach this group in several respects—for example, in the comparatively short vein R_2 and the straight, strongly down-bent Cu_2. However, the hypopygium of a few species which I have examined does not seem to show any very close affinity between the two groups.

7. *The* rubrescens *Group.*—Included under this heading are the seven species from *stricklandi* to *angustipennis* in the key, under the number 27, and also *longifurca*, Alex., and *tripunctipennis*, Brun. Although there are among these some with five posterior cells and some with four, it is fairly certain that they are all somewhat closely related, except perhaps *E. stricklandi*, which differs from the others in its much larger frontal tubercle. Of the remaining species, four are represented in the British Museum by males, and the hypopygia of these have been examined. *E. rufiventris*, *E. pænulata* (text-fig. 2 m), and *E. pyrrhochroma* are very similar and have rather small bilobed parameres, the upper lobes smaller than the lower, both lobes projecting inwards; the penis is small and rounded; the outer clasper is rather abruptly narrowed a little before the tip, but not so much so as in many other species. *E. rubrescens* (text-figs. 1 c, 2 l) is somewhat different: the outer clasper with the tip more hook-like; parameres broad, rounded, not bilobed; penis very short, but pointed. *E. stricklandi* (known so far only from the female) would seem to be closely related to the N.-American *E. spinosa*, differing chiefly in the colour of

the abdomen and the larger size. Since *E. spinosa* is the type of the subgenus *Arrhenica,* O.-S., this name will be available for the group.

The preceding groups, though diverse in many respects,

Fig. 2.



Details of ædeagus of Old-World species of *Eriocera.* All ×40. Except in **h** (*E. schnusei*, Kuntze) only the penis and one paramere are shown.

a, *E. chrysomela*, sp. n.; **b**, *E. brunettii*, sp. n.; **c**, *E. plumbolutea*, sp. n.; **d**, *E. sinensis*, sp. n.; **e**, *E. lygropis*, Alex.; **f**, *E. kempi*, Brun., var. n. *longior*; **g**, *E. lanigera*, Walk.; **i**, *E. ornata* (End.); **j**, *E. verticalis*, Wied.; **k**, *E. crystalloptera*, O.-S.; **l**, *E. rubrescens*, Walk.; **m**, *E. penulata*, End.; **n**, *E. obscuripennis*, Edw.; **o**, *E. luteipennis* (Edw.).

In fig. **h** the whole ædeagus of *E. schnusei*, Kuntze, is shown in dorsal view: *p* = penis; *pa* = paramere; *bp* = basal plate; *dp* = dorsal plate.

have one character in common, the shortness of the penis, which is produced into two little points at the tip. In the remaining species the structural details are somewhat less varied, especially the venation, which shows few tangible modifications; the hypopygial structure is also fairly uniform, there being nearly always a pronounced preapical notch on the outer clasper, due to the abrupt narrowing of the shaft a little before the tip; the side-pieces are shorter than in the other groups, and the penis is nearly always long and pointed, often curved or hook-like, its tip scarcely ever produced into two points. The tip of R_1 is always considerably longer than r; Cu_1a generally nearer the apex than the base of the discal cell; R_3 always much longer than R_{2+3}; Cu_2 generally quite short and more or less curved. Here, again, there are species with four or with five posterior cells, but the species in each of these categories are not all closely related. On the whole, the classification by wing-markings and by the presence or absence of leaden-coloured bands on the abdomen seems to give the best expression of the natural affinities of the species. The following groups may be recognised:—

8. *The* chirothecata *Group*, including the three South-European species with five posterior cells and perhaps also *unicolor*, Meij., and *obscura*, Big. In this group the only species known to me in the male sex is *E. schnusei* (text-fig. 2 h). This has a short penis and parameres of similar structure to those of the *verticalis* group; in these respects, as well as in its coloration, it seems to connect the *verticalis* group with the *dichroa* group. On the other hand, the elongate second palpal joint of *E. schnusei* and *E. waterstoni* suggests a connection with the *rubrescens* group, through *E. stricklandi*. I am not acquainted with the type-species of *Penthoptera* (*chirothecata*, Scop.) or *Physecrania* (*obscura*, Big.), but from the published figures both would seem to belong to the same group as *schnusei*; if so, these generic names will be synonymous. This group may perhaps be regarded as representing the ancestral type of the genus, and as having given rise on the one hand to the *verticalis* group and on the other to the *dichroa* group.

9. *The* dichroa *Group* may be regarded as including all the species with blackish unmarked wings, and an entirely dull, partly orange abdomen. In a number of species, but not all, the first antennal joint is short. In the venation, R_1 is perfectly straight, its terminal section much longer than r. The outer clasper has a well-marked preapical notch; the parameres are bilobed, both lobes pointing inwards, but the ventral lobe straighter and longer than the dorsal; the penis rather long and pointed, but straight. (This applies to *scutellata* and *shiraki*; but a male of *semilimpida* examined appeared to have no penis: it may have been broken off.) *E. maculiventris*, Brun., is given as a synonym of *E. semilimpida*, Brun., on the authority of Brunetti (in letter),

though the descriptions do not quite agree, especially as regards the thorax.

Closely allied to the *dichroa* group, and certainly not separable from it subgenerically, are: (*a*) the *bicolor* group, with similar claspers, side-pieces, and parameres to those of the *dichroa* group, but with the penis somewhat longer and more curved; (*b*) the *morosa* group, with hypopygium similar to that of the *bicolor* group, but with quite different coloration; (*c*) the *albonotata* group, with three apical wing-spots, deep preapical notch on outer clasper, parameres almost simple, the dorsal lobe represented by a small backwardly-projecting tooth, penis straight; (*d*) the *albipunctata* group, with one apical wing-spot, side-pieces swollen at the base beneath, parameres broader than in the *albonotata* group (text-fig. 2 f), penis more or less curved; (*e*) the *infixa* group (*E. infixa*, *E. borneana*, and probably some other species with dull abdomen and ornate wings), with hypopygium resembling that of the *albonotata* group, but preapical notch of outer clasper less well-marked.

I do not know *E. javensis* (Dol.), but if, as seems likely, it is nearly related to *E. infixa*, the name *Oligomera* could be applied to the whole of this group, if it could be satisfactorily distinguished from the *chirothecata* group, which hardly seems possible.

10. *E. lunigera* (Walk.) has several peculiarities in its hypopygium (text-fig. 2 g). The side-pieces have a small rounded basal lobe studded with small blunt black spines; the outer clasper almost regularly narrowed to the tip, which is scarcely bent; the penis is very short and broad, but somewhat curved; the parameres with strong backwardly projecting basal tooth. Walker's type of *optabilis* has now nothing left but the head and thorax; these, however, agree exactly with *E. lunigera*, so that the two names most probably apply to the same species.

11. *The* plumbicincta *Group*, including the seven species under heading 88 in the key. All these are evidently closely allied, and, apart from the similarity of wing-markings (which is obscured but not obliterated in *E. chrysomela* by the development of yellow colour on the basal half) and in the abdominal banding, they agree in the presence and somewhat unusual length of cell M_1. The hypopygium is remarkable for the great length of the penis (see descriptions of the new species, and text-figs. 2 a, 2 b, 2 c); the outer claspers (text-fig. 1 a) have the preapical notch unusually small, the tip scarcely bent; the side-pieces of all the species

examined have more or less distinct basal lobes beset with spines, somewhat as in *E. lunigera.*

12. *The* nepalensis *Group*, including the eight species from *decorata* to *hilpa* in the key, is evidently nearly allied to the *plumbicincta* group, in spite of possessing only four posterior cells. The type of abdominal marking is very similar, the grey bands in the midde of tergites 2–5, which are so conspicuous in this group, being distinctly traceable in some of the members of the *plumbicincta* group. The relationship is also indicated in the hypopygium, the penis being rather long and hooked (text-fig. 2 **d**), though not nearly so long as in the *plumbicincta* group. The side-pieces, however, have no trace of spiny basal lobes. *E. sauteriana* and *E. leucotela* have a hypopygium similar to that of *E. nepalensis*. The name *Pterocosmus* would be available for this group, the type-species being *P. velutinus* (= *E. nepalensis*). Both Westwood's and Walker's types are in fairly good condition in the Oxford and British Museums respectively.

The *nepalensis* group seems to be connected with the *dichroa* group through the *morosa* group.

EXPLANATION OF PLATE X. Figs. 1–12.

Wings of Old-World species of *Eriocera*.

Fig. 1. *Eriocera fusca*, Edw. × 3.
Fig. 2. *E. umbripennis*, sp. n. × 2·5.
Fig. 3. *E. robinsoni*, sp. n. × 2·5.
Fig. 4. *E. flavicosta*, sp. n. × 2·5.
Fig. 5. *E. kempi*, Brun., var. n. *longior*. × 2·5.
Fig. 6. *E. albonotata*, Lw., var. n. *citrocastanea*. × 2·5.
Fig. 7. *E. chrysomela*, sp. n. × 3.
Fig. 8. *E. trimaculata*, sp. n. × 3.
Fig. 9. *E. combinata*, Walk. × 3.
Fig. 10. *E. leucotela*, Walk. × 3.
Fig. 11. *E. infixa*, Walk. × 3
Fig. 12. *E. borneana*, sp. n. × 3.

IV.—*New and little-known* Tipulidæ, *chiefly from Formosa.*—Part II. By F. W. Edwards.

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[Plate X. figs. 13–19.]

This paper is a continuation of one published by the writer under the above title in 1916 (Ann. & Mag. Nat. Hist. (8) xviii. pp. 245–269, pl. xii.), and deals chiefly with a further consignment of crane-flies received from Dr. T. Shiraki, chief Entomologist of the Agricultural Experimental Station, Taiboku, Formosa, early in 1920, who has again generously presented all the types to the British Museum.

As in the previous paper, a few additional crane-flies from the Oriental and Eastern Palæarctic regions have been dealt with; in this case, these all belong to the genus *Ctenacroscelis.*

The bibliography concerning Formosan Tipulidæ has been given in full by Alexander in a recent paper (Ann. Ent. Soc. Amer. xiii. pp. 249–270, Sept. 1920), and need not be quoted again here, but since, with those mentioned below, over 100 species have now been recorded from the island, it may be of use at this juncture to enumerate them.

List of the Crane-flies hitherto recorded from Formosa.

Ptychopteridæ.

Ptychoptera distincta, Brun.
—— cf. *japonica*, Alex.

Tipulidæ.

LIMNOBIINÆ.

LIMNOBIINI.

Dicranomyia fullowayi, Alex.
[—— *punctulata*, Meij.]
—— *puncticosta*, Brun.
— *convergens*, Meij.
—— *alticola*, Edw.
—— *pleurilineata*, Ried.
—— *nigrithorax*, Brun.
—— *tenella*, Meij.
Thrypticomyia saltans (Dol.).
Geranomyia septemnotata, Edw.
[—— *pulchripennis*, Brun.]
—— *argentifera*, Meij.
atrostriata, sp. n.
[—— *montana*, Meij.]
Limnobia nigriceps (Wulp) (= *rectangularis* (Ried.).
—— *xanthopteroides*, Ried.
—— *nitobei*, Edw.
—— *atridorsum*, Alex.
—— *umbrata*, Meij.
Libnotes regalis, Edw.
—— *transversalis*, Meij.
—— *limpida*, Edw.

ANTOCHINI.

Helius nigriceps (Edw.).
[—— ? *unicolor*, Brun.]
—— *barbatus*, sp. n.
Teucholabis fenestrata, O.-S.
—— *inornata*, Ried.
Teucholabis nigerrima, Edw. (= *unicolor*, Ried.).
Paratropeza (*Gymnastes*) *ornatipennis* (Meij.).
—— (——) *shirakii*, Alex.
—— (——) *hyalipennis*, Alex.
Atarba pallidicornis, Edw.
—— *fuscicornis*, Edw.
Antocha javanensis, Alex.

ERIOPTERINI.

Gonomyia (*Gonomyia*) *metatarsata*, Meij.
—— (——) *pruinosa*, Alex.
—— (*Lipophleps*) *gracilis*, Skuse.
—— (——) *nebulosa*, Meij.
Gnophomyia (*Gnophomyia*) *orientalis*, Meij.
—— (——) *similis*, Edw.
(——) *strenua*, Brun.
(——) *nigra*, Brun.
—— (*Dasymallomyia*) *signata*, Brun.
Styringomyia formosana, Edw.
ceylonica, Edw.
—— *flava*, Brun.
—— *flavitarsis*, Alex.
Ormosia (*Rhypholophus*) *formosanus*, sp. n.
Molophilus costalis, Edw.
—— *nigripes*, sp. n.
Tasiocera fragilicornis, Ried.
Erioptera (*Empeda*) *nigroapicalis*, Alex.
—— (——) *minuscula*, Alex.
—— (*Erioptera*) *insignis*, Edw.
—— (——) *alboguttata*, Edw.
—— (——) *flava*, Brun.

Trentepohlia (*Trentepohlia*) *trentepohli* (Wied.).
(——) *albogeniculata* (Brun.).
(*Mongoma*) *pennipes*, O.-S.
Conosia irrorata (Wied.).

LIMNOPHILINI.

Limnophila (*Limnophila*) *inconcussa*, Alex.
—— (——) ***nigronitida***, sp. n.
—— (*Dicranophragma*) *formosa*, Alex.
(*Ephelia*) *fascipennis*, Brun.
Epiphragma kempi, Brun.

HEXATOMINI.

Eriocera verticalis, Wied.
—— *nigrina*, Ried.
—— *sauteriana*, End.
—— *rubriceps*, Edw.
—— *shirakii*, Edw.
[—— *testacea*, Brun.]
—— *lygropis*, Alex.

PEDICIINI.

Rhaphidolabis brunettii, Edw.
Tricyphona formosana, Alex.

TIPULINÆ.

CTENOPHORINI.

Pselliophora ctenophorina, Ried.
—— *hoppo*, Mats. (=*semirufa*, Edw.).
—— *scalator*, Alex.
[—— *taprobanes*, Walk.]
—— ***laneipes***, sp. n.
Dictenidia formosana, Alex.

DOLICHOPEZINI.

Dolichopeza ?orientalis, Brun.
Nesopeza gracilis, Meij.
Oropeza sauteri, Ried.

TIPULINI.

Brithura conifrons, Edw.
Longurio rubriceps, Edw.
Ctenacroscelis clavipes, sp. n.
—— ***similis***, sp. n.
[—— *sikkimensis*, End.]
Tipula holoserica, Mats. (= *rufomedia*, Edw. = *nigrorubra*, Ried.).
—— *coquilletti*, End.
—— *nova*, Walk. (=*nohirai*, Mats. =*fumifasciata*, Brun.).
—— *formosicola*, Alex.
—— *yamata*, Alex
—— *shirakii*, Edw.
—— *tridentata*, Alex.
—— *pluriguttata*, Alex.
—— *bicornuta*, Alex.
—— *subapterogyne*, Alex.
—— ***flavicosta***, sp. n.
—— ***quadrifulva***, sp. n.
—— ***biserra***, sp. n.
—— ***terebrata***, sp. n.
—— ***arisanensis***, sp. n.
Nephrotoma virgata (Coq.).
—— *citrina* (Edw.).
[—— *serricornis*, Brun.]
—— *delta*, Walk.
—— *javensis* (Dol.).
[—— *bombayensis*, Mcq.]
—— *parva* (Edw.).
—— *formosensis*, Edw.
[—— *palloris*, Coq.]

The ten species mentioned in square brackets have been recorded by Riedel; their occurrence in Formosa requires confirmation, since in each case it is possible or probable that the species concerned was really the one immediately preceding in the above list.

LIMNOBIINÆ.

LIMNOBIINI.

Geranomyia atrostriata, sp. n.

Head, including antennæ and proboscis, blackish. Front very narrow, almost linear. Flagellar joints approximately equal, oval, last joint narrow and pointed. Verticils not longer than the joints. Proboscis about as long as head and thorax together. *Thorax* blackish grey, slightly shining in certain lights; two dull black lines on the posterior half of the præscutum, interrupted at the suture, and continued across the scutum. Shoulders, wing-attachment, and most of sternopleura tinged with ochreous. *Abdomen* blackish above, ochreous below; hypopygium brownish ochreous, fleshy claspers elongate-oval, quite twice as long as the side-pieces; upper claspers small, deeply bifid, both branches curved, the outer one sharp-pointed, the inner with rounded tip. *Legs* dark brown; coxæ and trochanters ochreous. *Wings* slightly brownish-tinged; stigma dark brown; very small brown clouds at base of Rs and at tip of Sc. Sc_2 close to tip of Sc_1; the usual accessory cross-vein present connecting Sc and R; Rs nearly straight, longer than basal section of R_{2+3}; discal cell elongate, more than twice as long as broad, and somewhat longer than the veins beyond it; Cu_1a just before base of discal cell. Costal fringe very short, shorter than the fringe of the hind margin. *Halteres* with ochreous stem and dark brown knob.

Length of body (excluding proboscis) 6 mm.; wing 7 mm.; proboscis 2·2 mm.

FORMOSA: Ringaurin, Nanto, 18.xii.1916 (*T. Shiraki*), 1 ♂.

This species seems most nearly allied to *G. montana*, Meij., differing in the short costal fringe and the two black lines on the thorax.

Libnotes limpida, Edw.

Ann. & Mag. Nat. Hist. (8) xvii. p. 355 (1916).

FORMOSA: Arisan, 25.iv.1917 (*T. Shiraki*). Two females, agreeing closely with the type from the Malay States.

Libnotes transversalis, Meij.

Tijd. v. Ent. lix. p. 198 (1916).

FORMOSA: Arisan, 25.iv.1917 (*T. Shiraki*), 1 ♂.

The specimen agrees closely with de Meijere's description. Although superficially very similar to *L. limpida*, it is really quite distinct.

ANTOCHINI.

Helius [*Rhamphidia*] *nigriceps* (Edw.).

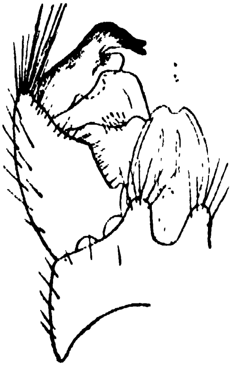
Ann. & Mag. Nat. Hist. (8) xvii. p. 358 (1916).

FORMOSA: Arisan, 24.iv.1917 (*T. Shiraki*), 1 ♂, 1 ♀.

Somewhat larger and darker than the original Siamese specimens, but identical in structure.

Helius barbatus, sp. n. (Text-fig.)

Closely allied to *H. nigriceps*, Edw., differing only in the structure of the antennæ and hypopygium. The antennæ are about as long as the head and proboscis together, the first three or four flagellar joints swollen, markedly broader than long, the next few joints gradually narrower but no longer, all with rather short dense hair; the last six joints long and very slender (especially the last) and each provided with a few long hairs, more than twice as long as the joint bearing them. *Hypopygium*: ninth tergite produced into two conspicuous hairy points. The eversible anal segment with four narrow chitinous strips. Tips of side-pieces with long dense yellowish hair, the hairs microscopically serrate. Both pairs of claspers very broad, the outer one with the usual black bifid tip, and also with a double membranous lobe on the inner side.



Helius barbatus, sp. n.
Male hypopygium from above. × 40.

FORMOSA: Arisan, 24.iv.1917 (*T. Shiraki*), 1 ♂.

ERIOPTERINI.

Ormosia (*Rhypholophus*) *formosanus*, sp. n.

Head, thorax, and abdomen uniformly dark brownish, the abdomen somewhat darker; pubescence inconspicuous, pale. Palpi black. Antennæ dark brown, flagellar joints all shortly oval. Ovipositor reddish; genital valves long, almost reaching tips of the gently curved anal valves. *Legs* dark brown, with a slight purplish sheen; front and middle femora with a narrow ring of yellowish pubescence before the tip, and another much narrower still at the extreme tips. (Hind legs missing.) *Wings* with the venation of *R. varius*, Mg. Cord somewhat darkened, but no clear spot in cell R_1 beyond the stigma. *Halteres* pale yellow, apical half of knob pure white.

Length of body 3·2 mm.; wing 4·8 mm.

FORMOSA: Noko, 11. v. 1919 (*T. Shiraki*), 1 ♀.

Apparently closely allied to *R. pulcher*, Brun., from which it differs in the unicolorous thorax.

Molophilus nigripes, sp. n.

Head dull dark grey. Palpi black. Antennæ longer than thorax, blackish; flagellar joints all rather elongate-oval, gradually and slightly diminishing in length, with one or two longish stiff hairs near base, and clothed in addition, except at base and tip, with long soft pubescence, about as long as the joint which bears it. *Thorax* dull black, with short black pubescence; a whitish line at margin of mesonotum. *Abdomen* black, slightly shining, with moderately long yellowish pubescence. Hypopygium: ventral lobe of side-piece long and narrow. Claspers long, rather slender, nearly straight; upper pair sharp-pointed, lower pair with rounded tips. Ædœagus not visible externally. *Legs* blackish, the trochanters yellow. *Wings* slightly greyish; costa and radial vein yellowish; hair rather light brown, paler towards costa. Ax ending slightly beyond fork of Cu. *Halteres* yellow.

Length of body 3·2 mm.; wing 4·8 mm.

FORMOSA: Noko, 11. v. 1919 (*T. Shiraki*), 1 ♂.

The only other described Oriental species with similar antennæ is *M. assamensis*, Brun., which has yellow legs.

LIMNOPHILINI.

Epiphragma kempi, Brun.

Rec. Ind. Mus. viii. p. 155 (1913).

FORMOSA: Arisan, 25. iv. 1919 (*T. Shiraki*), 1 ♂.

Limnophila nigronitida, sp. n.

Head black, slightly dusted with grey. Palpi and antennæ black; antennæ shorter than the thorax; flagellar joints roundish, somewhat more convex below, apical joints not much smaller than the basal ones; verticils about as long as the joints. *Thorax* and *abdomen* uniformly shining black, only the pleuræ slightly grey-dusted and the ovipositor reddish. *Legs* black, the femora and tibiæ brownish except at tips. *Wings* slightly greyish, unmarked except for the darker grey stigma. Sc ending distinctly in costa; Sc_2 near tip of Sc_1; *r* about its own length from tip of R_1, and at about mid-length of R_2; R_{2+3} very short; Rs rather long and nearly straight; the three veins closing the upper basal cell rather thick and about equal in length; cell M_1 absent; cross-vein *m* very oblique, longer than basal section of M_3. Cu_1a before middle of discal cell. *Halteres* light yellow.

Length of body about 5 mm.: wing 6 mm.

FORMOSA: Funkiko, 23. ii. 1917 (*T. Shiraki*), 1 ♀.

Among described Oriental species this can only be compared with *L. quartarius*, Brun., which has a similar venation, but is quite different in colour.

TIPULINÆ.

CTENOPHORINI.

Pselliophora lancipes, sp. n. (Pl. X. fig. 14.)

Head orange, with black hair on the vertex, brownish to golden hair on the face and rostrum. Palpi with the three basal segments brownish, black-haired; terminal segment yellowish, black at the base and tip. Antennæ with the basal segment orange, with a dark brown stripe on the outer side; remainder black, except for the tips of the flagellar joints, which are light brownish. *Thorax* bright orange; præscutum with three distinct black stripes, the middle one entire, the lateral ones continued across the scutum. Scutellum with rather long and dense brownish-orange hair. *Abdomen* orange; a narrow black median stripe on tergites 2–4, interrupted with orange on the posterior margins of the segments, and continuous with the narrow black lateral posterior borders of these segments; venter similar. *Hypopygium* black. Ninth tergite with two rounded lobes, each provided with a long dense tuft of dark brown hair (much longer than in *P. scalator*, Alex.). Ninth sternite much as in *P. scalator* (deeply bilobed, each lobe with a strong smooth spine on its inner side). Eighth sternite produced into a cup-shaped process similar to that of *P. scalator*, but shorter. Outer claspers pointed, not square-ended as in *P. scalator*. *Legs* with the coxæ and trochanters bright orange, the femora orange with the tips rather narrowly black; tibiæ and tarsi almost black. Front and middle femora with short black pubescence, hence appearing dark; hind femora with almost entirely orange pubescence, which on the inner side of basal half is very long and dense (as in males of the very differently coloured *P. divisa*, Brun., and *P. speciosa*, Edw.). Hind tibiæ with a rather narrow yellowish ring near the base. *Wings* resembling those of *P. scalator* (see Pl. X. figs. 13 & 14) in their black and yellow pattern, but all the apical cells of the wing are conspicuously yellow basally in their centres. Rs conspicuously spurred near base; cell M_1 rather broadly sessile; cells Cu_1 and Cu_2 of equal breadth at the margin; *m–cu* distinct. *Halteres* orange; knob with a black spot at the base above.

Length of body 17 mm.; wing 15 × 5 mm.

FORMOSA: Taito, 25. ii.–27. iii. 1919 (*S. Inamura, J. Sonan, M. Yoshino*), 1 ♂. Related to *P. scalator*, Alex., differing chiefly in the hypopygium and hind femora.

DOLICHOPEZINI.

Dolichopeza sp., cf. *orientalis*, Brun.

Fauna Brit. Ind., Nematocera, p. 354 (1913).

FORMOSA: Ringaurin, Nanto, 18. xii. 1916 (*T. Shiraki*), 1 ♂. Very similar to *D. orientalis*, Brun., but probably distinct, the white on the legs being less extensive. The specimen, however, is too damaged for purposes of description.

TIPULINI.

Tipula flavicosta, sp. n. (Pl. X. fig. 15.)

Head ash-grey, with a narrow black median line; sides of rostrum and palpi black. Nasus short, simple. Antennæ as long as the thorax, with the first three joints pale ochreous, the rest black. First flagellar joint nearly twice as long as the second, slightly longer even than the first scapal, nearly cylindrical; remaining flagellar joints (except the small terminal one) all about equal in length, very slightly enlarged at the base; verticils shorter than the joints. *Thorax* almost bare, ash-grey; præscutum with three slightly darker stripes, the middle one divided by a dark line; scutellum and postnotum dark grey. *Abdomen* somewhat shining, dark brownish, the last few segments almost black, no distinct markings. Ninth tergite large, with a rather small median V-shaped notch. Eighth sternite large, square-ended, nearly covering the ninth. Outer claspers ochreous, broadly expanded at base, almost triangular. Inner claspers ochreous in the middle, with strongly blackened pointed tips; at the base with a strong straight sharp spine, and between this and the main portion a small flat horizontal lobe with a rounded edge. *Legs* black, only the coxæ grey and the extreme base of the femora yellowish. *Wings* (see Pl. X. fig. 15) with the base and the costal and subcostal cells and the veins bordering them yellow, otherwise greyish with some clear markings and dark-bordered veins. Tip of R_2 entirely atrophied beyond the cross-vein; *m–cu* very distinct. *Halteres* yellow.

Length of body 9 mm.; wing 11 mm.

FORMOSA: Noko, 11. v. 1919 (*T. Shiraki*), 1 ♂.

Nearly related to the Japanese *T. truphecneura*, Alex. (which is known only from the female), but differs in the pale first joint of the antennæ, simple nasus, darker legs, etc.

Tipula quadrifulva, sp. n. (Pl. X. fig. 19.)

Head: front bright ochreous on the upper part, whitish yellow just above the antennæ; vertex brownish ochreous, darker in the middle, with a blackish median line which does not extend on to the front. Rostrum ochreous with rather narrow blackish lateral stripes. Palpi brownish. Antennæ with the scape ochreous, flagellum blackish. First scapal joint elongate, twice as long as the first flagellar. Verticils longer than the joints. Flagellar joints (except the first) slightly swollen at the base; third and fourth equal in length, slightly longer than the first or second; last joint minute. *Thorax*: præscutum with four distinct dark olive-brown stripes, which have their outer borders slightly, their inner borders considerably, darkened; interspaces between the stripes pale greyish ochreous, with rather long fine yellowish hair. Scutum whitish grey on the front margin, the usual two large dark marks olive-brown, darkened on their anterior and inner edges Scutellum and postnotum long-haired, greyish ochreous, with a conspicuous blackish-brown median line. Pleuræ uniformly ochreous. *Abdomen* with segments 1–4 ochreous-orange; 5–8 blackish, with the hind margins narrowly pale; tergites 5–8 together scarcely longer than tergite 4. Sternite 8 with its posterior corners produced into two short lobes, which are made more conspicuous by being clothed with long yellowish hair, the middle part of the sternite convex. Ninth tergite with a rather small median projection, which is bifid and covered apically with small black spines. *Legs* blackish, femora ochreous towards the base. *Wings* with a conspicuous pattern (see Pl. X. fig. 19). *Halteres* ochreous-brown, knob mostly pale yellowish.

Length of body 14 mm.; wing 18 mm.

Formosa: Musha, 10. v. 1917 (*T. Shiraki*), 1 ♂.

Evidently nearly allied to *T. marmoratipennis*, Brun., *T. serricornis*, Alex., and other species of the same large and rather difficult group. The wing-markings are extremely similar to those of the two species named, but the hypopygium differs.

Tipula biserra, sp. n. (Pl. X. fig. 18.)

Head ochreous, a roughly diamond-shaped dark mark on the vertex, continued forwards almost to base of antennæ; sides of rostrum somewhat darkened. Palpi blackish, the tips of the joints light brown. Antennæ ochreous, flagellar joints slightly enlarged and distinctly blackened at the base; verticils a little longer than the joints. First flagellar joint a little shorter than the first scapal; second and third flagellar joints distinctly shorter than the first and fourth; last joint minute. *Thorax* dull greyish brown, the præscutum with three dark brown stripes, which have slightly darker edges, the median stripe divided by an indistinct pale line. Scutellum and postnotum with a dark brown median line, not very conspicuous. Pubescence short and inconspicuous. *Abdomen* elongate, ochreous-brown, with continuous median and lateral dark brown longitudinal stripes. Ninth tergite long, almost equal to the long anal valves of the ovipositor; these latter almost straight, with two keels on the outer face, both of which are conspicuously serrate, the inner face hairy. Genital valves very short, not reaching base of anal valves. *Legs* dark brown; femora somewhat lighter, with black apical rings. *Wings* as in Pl. X. fig. 18; note particularly the uniformly brown apex, and the shape of the pale markings in the lower basal cell. *Halteres* blackish; base of stem ochreous, tip of knob yellowish.

Length of body 23 mm.; wing 20 mm.

Formosa: Arisan, 24. iv. 1917 (*T. Shiraki*), 1 ♀.

Though this species is also obviously related to *T. serricauda*, Alex., and *T. serridens*, Alex., the resemblance is not so close as in the case of *T. quadrifulva*, since the wing-markings show obvious differences. The two rows of teeth on each anal valve of the ovipositor have not been described in any other species, but may have been overlooked.

Tipula terebrata, sp. n. (Pl. X. fig. 16.)

Head brownish ochreous, sides of rostrum rather darker, the long nasus almost blackish. A black stripe extending from between antennæ almost to nape. Scape of antennæ ochreous, flagellum black. First flagellar joint shorter than first scapal, but nearly as stout; second and third flagellar joints slightly shorter than the first and fourth; remaining joints scarcely perceptibly enlarged at the base; verticils about as long as the joints. *Thorax* rather dark greyish buff, with short and inconspicuous pubescence. Præscutum with four olive-green stripes, which have conspicuously darker margins; the inner margins of the two middle stripes fused in front and almost black. Scutellum and postnotum with a sharply defined blackish median line. *Abdomen* ochreous-brown with a broad median and narrow lateral black longitudinal stripes; extreme side-margins of tergites whitish. Ninth tergite very long, longer even than the anal valves; these latter thick at the base, not flattened, almost straight, without any trace of serration on the outer keels; genital valves well-developed, but still not quite reaching the base of the anal valves. *Legs* moderately stout, blackish, femora brown except for the rather broad black apical rings. *Wings* as in Pl. X. fig. 16; note the conspicuous pale area round Rs. *Halteres* ochreous, base of knob blackish.

Length of body 22 mm.; wing 21 mm.

Formosa: Musha, 10. v. 1917 (*T. Shiraki*), 1 ♀.

Though similar in general appearance to the two above described, this species is really very distinct from either. It seems to be related to the Japanese *T. terebrina*, Alex., which is described as having a similar ovipositor.

Tipula arisanensis, sp. n. (Pl. X. fig. 17.)

Head ochreous with a median longitudinal black line. Palpi blackish. Antennæ with the scape ochreous; first flagellar joint much shorter than first scapal, ochreous, darkened in the middle; second, third, and fourth flagellar joints each shorter than the first or fifth, brownish ochreous, blackened at the base; remaining joints blackish brown, slightly swollen at the base; all flagellar joints except the first and last with two moderately long hairs above, none below. *Thorax* brownish ochreous; the præscutum with three darker brown stripes, without dark borders, the middle stripe divided posteriorly by a pale line. Scutal lobes each with two separate dark brown spots. Scutellum and postnotum with a dark brown median stripe, most conspicuous when viewed from in front. *Abdomen* brown with rather obscure darker brown median and lateral longitudinal stripes; apical corners of tergites pale. Ninth tergite very long, longer than the anal valves, these of the normal form, flattened, pointed, only slightly enlarged at the base, without distinct outer keels. Genital valves well-developed, just reaching base of anal valves. *Wings* as in Pl. X. fig. 17; note the rather long fusion of Cu_1 and M_3. *Halteres* ochreous, base of knob blackish.

Length of body 13 mm.; wing 14 mm.

Formosa: Arisan, 24. v. 1917 (*T. Shiraki*), 2 ♀.

I have not been able to trace a previous description of this species. The wing-markings are very similar to those of *T. quasimarmoratipennis*, Brun., which evidently belongs to the same group.

Tipula demarcata, Brun.

Rec. Ind. Mus. vi. p. 259 (1911).

Formosa: Suisha, Nanto, 22. xii. 1916 (*T. Shiraki*), 1 ♂, 1 ♀.

The female agrees closely with a female in the British Museum from Trincomali, Ceylon (*Lt.-Col. Yerbury*), and also with Brunetti's rather imperfect description; the species is one of a group which is rather numerous in the Oriental region, distinguished by the unicolorous wings and very narrow axillary cell. *T. demarcata* is distinguished from the other species known to me by the grey thoracic pleuræ, contrasting noticeably with the brown dorsum. Other nearly allied species are *T. sulaica*, Walk., *T. vilis*, Walk., *T. walkeri*, Brun. (*fulvipennis*, Walk.), *T. gedehicola*, Alex., *T. korinchiensis*, Edw., etc. Some of these show good specific distinctions in the antennæ.

It may be noted here that Brunetti's *Pachyrhina demarcata* is also a *Tipula*, and requires renaming. I suggest *Tipula sessilis*, nom. nov., basing the name on a male and female in the British Museum from the Nilgiri Hills, 6700 ft., 8. xii. 1887 (*Sir G. F. Hampson*).

Nephrotoma delta (Walker).

Tipula delta, Walker, Ins. Saund. i. p. 445 (1856).
Pachyrhina dorsopunctata, Brunetti, Rec. Ind. Mus. vi. p. 265 (1911).

FORMOSA: Chyoshu, 21. xi. 1916 (*T. Shiraki*), 1 ♀.

Agrees well with Walker's type and with Brunetti's description.

CTENACROSCELIS, Enderlein.

The species dealt with below all belong to the *brobdignagius* group, the members of which are distinguished by their great size, brownish wings without conspicuous markings, vein Cu more or less dark-bordered, especially about the fork, and a narrow dark stripe on the ochreous pleuræ extending from the neck to below the wing-base; the præscutum has three almost confluent blackish-grey stripes, the middle one more or less distinctly divided by a dark line; the antennæ, except for the apical part of the flagellum, are light ochreous, and have the verticillate hairs very short, sometimes barely perceptible.

The *umbrinus* group shows a very similar coloration, but the insects are much smaller, the first joint of the antennæ is dark, and the præscutum generally has four dark stripes, the middle pair separated by a narrow pale line.

The *præpotens* group (*præpotens*, Wied., *monochrous*, Wied., *rex*, Alex., etc.) differs from the *brobdignagius* group in the absence of the dark pleural stripe. There is a female specimen of *C. præpotens* (Wied.) in the British Museum from Java, which is amply distinct from all the species of the *brobdignagius* group: the præscutum has four distinct dark stripes; the wings, apart from the yellowish stigma, are uniformly greyish, without a trace of darkening on vein Cu. Doubtless a number of species have been confused under the name *præpotens*, and its range is not likely to be so extensive as has been supposed. The specimen recorded by Walker from Nepal is not this species, but apparently *C. dives* (Brun.) or a very closely allied species; another example in the British Museum labelled *præpotens* is in reality *C. fulvolateralis* (Brun.) (? = *sikkimensis*, End.). Both these species belong to the *brobdignagius* group.

Ctenacroscelis clavipes, sp. n.

Head rather deep ochreous above, dark grey behind the eyes; pale ochreous beneath; sides of rostrum dark brown;

the usual blackish dot over the base of each antenna. Antennæ with the first few joints ochreous; flagellum mostly dark; first flagellar joint slender, as long as the first scapal, second and third shorter, almost cylindrical; the following joints somewhat convex beneath. *Thorax* coloured much as in the other species of the group. Middle præscutal stripe reaching front margin; pronotum with a dark spot above; scutellum yellowish with two dark spots, nearly contiguous, close to base; postnotum mostly dark brownish, more or less grey-dusted, a narrow median grey line enlarging at the tip into a grey spot. *Abdomen* dark brownish dorsally, with a rather broad ochreous median stripe, which is not distinctly traceable beyond the apex of the second tergite; rather narrow pale ochreous lateral stripes; venter pale, especially towards the base. *Hypopygium*: ninth tergite bilobed, the median excavation broadly V-shaped, each lobe on its outer face with a tuft of long golden hairs. Eighth sternite with the usual semicircular excavation, with yellow hairs which are not very conspicuous. Outer clasper a little over twice as long as broad, almost square-ended, without conspicuous yellow hairs projecting inwards from its base. Inner claspers clubbed on the apical half. *Ovipositor* reddish; anal valves long, slender, straight, hairy beneath. *Legs* brownish ochreous, tarsi darker apically; femora and tibiæ rather broadly black at the tips; tips of hind tibiæ considerably swollen, especially in the male, in which sex the tip of the tibia for a distance of over a millimetre is more than twice the average diameter of the joint. Fifth tarsal joints of male modified in the usual way. *Wings* brownish-tinged, base, costal cell, stigma, and a suffusion in the base of the basal cells darker brown; a slight suffusion round the fork of Cu and at the extreme tip of Ax; a faintly indicated pale area above the discal cell, just before the stigma. Cross-vein *r* before base of R_2; Rs equal to R_{2+3}; stem of cell M_1 very short, about one-eighth to one-sixth as long as the cell; M_1 and M_2 parallel; Cu_1a very oblique, fused for a short distance with M_3. *Halteres* blackish, base of stem ochreous.

Length of body, ♂, 26–30 mm.; ♀, 35 mm. Wing 34–42 mm.

FORMOSA: Koshun, 25. iv.–25. v. 1918 (*J. Sonan, K. Miyake*, and *M. Yoshino*), 1 ♂ (type). Taito, 25. ii.–27. iii. 1917 (*S. Inamura, J. Sonan*, and *M. Yoshino*), 1 ♂. Kusukusu, 19. v. 1918 (*K. Miyake*), 1 ♀. NORTH CHINA (*Fortune*), 1 ♂. This last specimen is certainly conspecific with those from Formosa, but differs in having the pale median stripe of the abdomen narrower and more distinct, extending as far as the sixth tergite.

Ctenacroscelis similis, sp. n.

Differs from *C. clavipes* as follows:—Flagellar joints almost cylindrical, scarcely convex beneath. Postnotum with a broad greyish median stripe, occupying about one-third of the width, sides dark brown. Anal valves of ovipositor not hairy beneath. Femora with the black tips less clearly marked; tibiæ scarcely darkened and not at all swollen apically. Pale area above the discal cell reduced to a small dot before the stigma; costal cell and stigma not quite so dark.

FORMOSA: Arisan, 24. iv. 1917 (*T. Shiraki*), 1 ♀ (type); a second female without precise locality, captured 6. iii. 1908 (*A. E. Wileman*).

Ctenacroscelis fulvolateralis (Brun.)
(? =*sikkimensis*, End.).

This species is nearly related to the above-described *C. similis*, but the pronotum is scarcely darkened; the middle præscutal stripe does not quite reach the front margin (except for the dark line in its centre); the postnotum is mainly dark greyish, paler on its apical margin, dark brown only on its extreme lateral edges; the stigma is pale brown, somewhat lighter than the costal cell, and there is a suggestion of a pale band along the middle of the wing from the base of the axillary cell to just before the stigma. The antennæ have distinct short verticillate hairs, and the flagellar joints convex beneath, as in *C. clavipes*, but the hind tibiæ are not swollen at the tip in either sex. The male hypopygium has the ninth tergite more deeply bilobed than in *C. clavipes*, the lobes without conspicuous golden hair-tufts, the inner claspers conspicuously clubbed at the tips. British Museum material is from Upper Burmah, Sikkim, and Nepal.

Ctenacroscelis majesticus (Brun.).

This is also nearly related to *C. similis* and *C. fulvolateralis*, the hind tibiæ not being enlarged or even darkened at the tips in either sex. From both these species it differs in the conspicuous ochreous patch just in front of the suture in the middle, the slightly but distinctly separated thoracic stripes, and the almost uniformly coloured yellowish-brown wings, with hardly a trace of a stigma. The hypopygium has small golden hair-tufts on the lobes of the ninth tergite; the inner claspers are not clubbed at the tip as in *C. fulvolateralis.* The greyish-brown head; the sharply defined dark thoracic markings; the darkened tips of the femora; and the position of *r*, which joins R_{2+3} well before the fork, will suffice to distinguish *C. majesticus* from *C. fulvipes*, sp. n.

There are three males and one female in the British Museum from Sikkim: Gopaldhara, Rungbong Valley, 1920 (*H. Stevens*). The body-length of the males, exclusive of the head, varies from 20–30 mm.

Ctenacroscelis brobdignagius (Westw.).

Westwood's type male has the wings almost wholly yellowish brown, including the stigma; a small dark reddish-brown dot on each side of R_{2+3} close to its base; the hind tibiæ are broadly black and somewhat swollen at the tip, but less so than in *C. clavipes*; the postnotum has a broad greyish-ochreous median stripe occupying quite half its width; the pale median stripe of the abdomen is broad and is scarcely traceable beyond the first segment.

Two males and a female from mountains 50 miles northwest of Chengtu, China (*W. N. Fergusson*), differ in having the wings more greyish brown; no dark dots at base of R_{2+3}; the stigma and an area above and below it whitish, also the base of the axillary cell and a streak along each side of An whitish; the pale stripe on the postnotum is narrower; and the abdomen with a narrower and fairly distinct median pale stripe extending almost its whole length. I at first took these for a distinct species, which indeed they may be, but another male from Taipaishan, Shensi, 7. viii. 05 (*Lord Rothschild*), is about as intermediate as possible. The hypopygium is similar to that of *C. clavipes*, but lacks the golden hair-tufts on the lobes of the ninth tergite, these being represented merely by a few short yellow hairs. The wing-length varies (independently of sex) from 40–49 mm.

Ctenacroscelis fulvipes, sp. n.

Head, including antennæ, wholly ochreous, sides of rostrum darker; palpi blackish (at least at base); antennæ constructed as in *brobdignagius* and *clavipes*. *Thorax* ochreous, the brown pleural stripe of the ***brobdignagius*** group narrow, but distinct; præscutum with three broad greenish-brown stripes which are not dark-margined, the middle one just divided, the lateral stripes crossing the scutum. Scutellum and postnotum wholly greyish ochreous. ***Abdomen*** brown, with an indistinct ochreous median longitudinal stripe, interrupted on the hind margins of the segments, and continuous lateral pale stripes. Ovipositor shining ochreous, anal valves slender, bare, but shorter and stouter than in *C. brobdignagius*, not greatly exceeding the genital valves in length. *Legs* almost wholly fulvous, only the ctenidia, spurs, and extreme tips of the tibiæ and tarsal joints black. *Wings* yellowish brown, costal cell and stigma concolorous; a slight smoky appearance on the lower part of the cord; tips of cells R_2 and R_3 indistinctly pale, also bases of cells M_1 and *2nd* M_2; indistinct pale areas also in centres of cells An and Ax. Cross-vein *r* just touching base of R_2; cell M_1 just sessile on one wing, with a just perceptible stalk on the other; M_1 and M_2 slightly convergent. *Halteres* with blackish knob and ochreous stem.

Length of body 32 mm.; wing 37 × 8 mm.

CHINA: mountains 50 miles north-west of Chengtu (*W. N. Fergusson*), 1 ♀. In several respects, notably the absence of black tips to the femora, the colour of the postnotum, and the sessile cell M_1, this is quite a distinct species of the *brobdignagius* group.

Ctenacroscelis mikado (Westw.).

This differs from the other members of the *brobdignagius*, group in the colour of the postnotum, which is dark brown in the middle, ochreous at the sides. The abdomen shows no trace of a pale median stripe; the ninth tergite of the male has a short dense black pubescence round its apical margin. The British Museum possesses a male and female from Yokohama (*H. Prior*) and a female from Miyanoshita, Japan (*Yerbury*), which have been identified by comparison with Westwood's type.

EXPLANATION OF PLATE X. FIGS. 13-19.

Wings of Formosan Tipulidæ.

Fig. 13. *Pselliophora scalata*, Alex. × 3.
Fig. 14. *P. laneipes*, sp. n. × 3.
Fig. 15. *Tipula flavicosta*, sp. n. × 2.
Fig. 16. *T. terebrata*, sp. n. × 2.
Fig. 17. *T. arisanensis*, sp. n. × 2.
Fig. 18. *T. biserra*, sp. n. × 2.
Fig. 19. *T. quadrifulva*, sp. n. × 2.

.—*Two Examples of Abnormal Antennæ in the Crustacea Amphipoda.*

By CHAS. CHILTON, M.A., D.Sc., M.B., C.M., LL.D., C.M.Z.S., F.L.S., Professor of Biology, Canterbury College, New Zealand.

IN 1918 I published a note on an abnormal uropod in the amphipod *Orchestia marmorata*, Haswell *. Since then, in examining the Amphipoda of various collections, I have met with two examples of abnormal antennæ. These have been

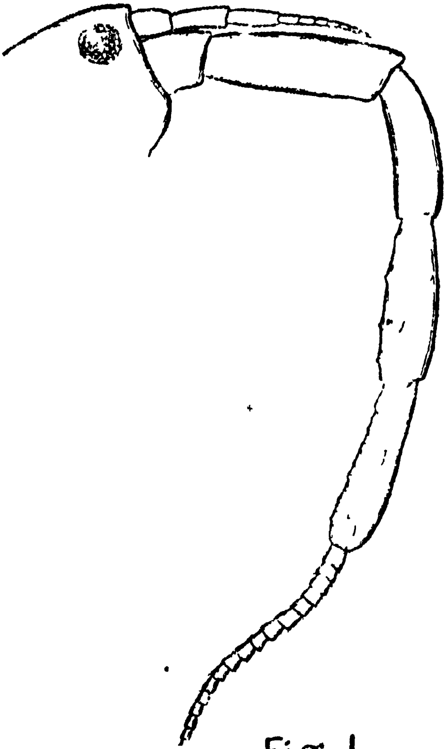


Fig. 1

Orchestia chiliensis, M.-Edwards. Antennæ, showing the two additional joints in the peduncle of the second antenna.

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* Journ. Zool. Research, vol. iii. p. 97.

briefly mentioned in the reports on the collections concerned; but a separate and somewhat fuller account seems desirable. Both examples occur in species belonging to the family Talitridæ, Stebbing (=Orchestidæ, auctorum)—namely, *Orchestia chiliensis*, Milne-Edwards, and *Hyale brevipes*, Chevreux, and in both cases it is the second or lower antenna that is abnormal.

In *Orchestia chiliensis* the normal second antenna is generally considered to contain five joints in the peduncle, the first and second being small and more or less fused with the head, the third distinct but short, and the fourth and fifth more elongated and generally subequal, the fifth being followed by the multiarticulate flagellum. The abnormal antennæ were met with in a specimen of this species from

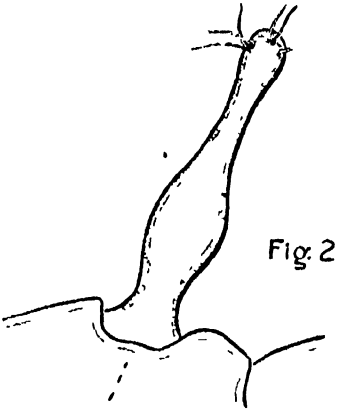

Fig. 2ª

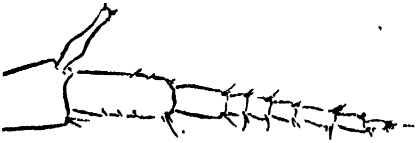

Fig. 2.

Hyale brevipes, Chevreux.

Fig. 2.—Second antenna, with abnormal appendage arising from fourth joint of peduncle.

Fig. 2 *a*.—The appendage more highly magnified.

Juan Fernandez, collected by the Swedish South Pacific Expedition. The antennæ are represented in fig. 1, from which it will be seen that in the second there are two additional joints in the peduncle, these being subequal in length and a little longer than the normal fifth joint. Both the right and left second antennæ have these two additional joints, the two antennæ being quite symmetrical. Through the semitransparent integument of the last two joints of the peduncle, the muscles and other soft parts can be indistinctly seen to be much contracted, and throughout the whole of the last joint and the distal portion of the preceding joint they appear to be segmented; apparently this appearance is produced by the soft parts of the flagellum and terminal peduncular joints being retracted preparatory to the next moult, but there is nothing to indicate with certainty whether the antenna after the moult will have the abnormal number of joints or whether it will revert to the normal form.

The second example occurs in a specimen of the small amphipod *Hyale brevipes*, Chevreux, from Chilka Lake, India, and is also in the second antenna. In the upper distal end of the fourth—that is, the penultimate—joint of the peduncle there projects upwards a small appendage nearly as long as the joint from which it arises. This appears to be separated from the joint by a distinct articulation; it broadens near the base, but narrows again towards the rounded apex, which bears about six setules, as shown in fig. 2 *a*. It bears some slight resemblance to a single-jointed secondary flagellum, but it arises on the second or lower antenna and from the penultimate joint of the peduncle, while the normal secondary appendage always arises from the last peduncular joint of the upper antenna. It is possible, of course, that this abnormal appendage has been the result of some injury. In this case the abnormality occurred on the one antenna of the pair only.

VI.—*The Prey of the Yellow Dung-Fly*, Scatophaga stercoraria, *L.* By Major E. E. Austen, D.S.O.

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In a preface to a valuable paper on the Yellow Dung-Fly recently published by Mr. G. S. Cotterell *, Prof. Maxwell

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* "The Life-History and Habits of the Yellow Dung-Fly (*Scatophaga stercoraria*); a possible Blow-Fly Check." By G. S. Cotterell. With a Preface by Prof. Maxwell Lefroy, F.Z.S. Proc. Zool. Soc. Lond. 1920, pt. iv, pp. 629-647, figs. 1-14 (December, 1920).

Lefroy remarks that observations made by him "show that while the fly preys on a large variety of Diptera, it specially attacks *Calliphora* and *Musca*." He states further that *S. stercoraria* is "a constant and general feeder on the common species of Blow-fly in England throughout the season," and he considers it to be "the most important direct enemy of the adult fly, a check which appears to be very effective in this country." Prof. Lefroy proceeds to explain that the author of the paper "investigated the best means of transporting this species to countries where Blow-fly is a serious pest to sheep, in the hope that it might be possible to utilise it as a check on Blow-fly." "This has not been possible as yet," writes Prof. Lefroy, "but the species seems to have much value in this connection, and . . . . . it is to be hoped it will eventually be made use of."

Anyone who knows anything of the importance and prevalence of the Sheep Blow-fly pest in Australia is well aware of the urgent necessity of discovering an effective remedy. If *S. stercoraria*, a hardy and fairly prolific predaceous Dipteron, does indeed *feed by preference upon Blow-flies*, and if it can be relied upon, without any kind of adventitious aid and *under natural conditions*, always to attack and destroy *Calliphora erythrocephala* (the Common Blow-fly) at sight, Prof. Lefroy by suggesting its introduction has not only gone a long way towards solving the problem at issue, but has established a just claim to the gratitude of every sheep farmer in the Commonwealth. While it is obvious that, before any predaceous insect can be regarded as even a "possible" check upon an insect pest, it must be shown that the normal relations between the two are not unlike those between the domestic cat and the common mouse, it would seem to be a legitimate deduction from the remarks of Prof. Lefroy quoted above that, in England, the Yellow Dung-fly behaves towards the Common Blow-fly in the manner just indicated.

Let us, however, briefly examine the available evidence as to the feeding-habits of *S. stercoraria*, and in particular let us see how far the experience of other observers is in agreement with that of Prof. Lefroy, whose statements have already been reproduced. Prof. Lefroy's original observations on the subject, at any rate, seem to have been made under artificial rather than under natural conditions, since he writes :—"The Yellow Dung-fly first showed itself in our work at the Zoological Society in 1915 in connection with methods of trapping flies : it came in numbers, persistently eating the adult Blow-flies, and seriously interfered with experiments out of doors." This statement, it must be admitted, leaves something to be desired, since it is not clear whether the Blow-flies, when attacked, were or were not at liberty. In the subsequent paper, however, all doubt is set at rest by Mr. Cotterell himself, who writes (*loc. cit.* p. 646):—"At the Zoological Gardens in 1915 Professor Lefroy's experiments with fly-traps were interfered with by the abundance of the adult *S. stercoraria* that fed on the trapped flies, chiefly Blow-flies of the genus *Calliphora*." Comment is scarcely needed, though it is perhaps permissible to point out, merely by way of illustration, that should a hungry leopard happen to find itself shut up in a cage with a litter of young badgers, and should that happen which under the postulated conditions would be most likely to occur, it would be unwise to draw from the tragedy anything like a dogmatic conclusion as to the favourite diet of *Felis pardus.*

Now as to what happens in nature, concerning which Prof. Lefroy's statements have been given above. Mr. Cotterell (*loc. cit.*) writes:—"The food of the adults is very varied but confined to other Diptera. The small Borborid fly (*Borborus equinus*) appears to be the chief article of diet in the field, chiefly as it breeds abundantly in horse excrement and as it passes the winter as an adult. Larger flies, however, are preyed upon, such as *Calliphora*, *Lucilia*, *M. domestica*, etc." It will be observed there is a curious discrepancy between the statements of Prof. Lefroy and of Mr. Cotterell, which as regards the most important detail are even mutually exclusive, since, while the former claims that *S. stercoraria* "specially attacks *Calliphora* and *Musca*," the latter asserts that *Borborus equinus*, Fln. (a small, narrow-bodied, bronze-black fly, measuring some 4·5 mm. in length, and perhaps not one-twelfth of the bulk of an average specimen of *Calliphora erythrocephala*) "appears to be the chief article of diet."

The evidence bearing upon the prey of the Yellow Dung-fly published prior to Mr. Cotterell's paper, albeit extremely scanty, does not support Prof. Lefroy's contention. Thus, according to Kirby & Spence*, "*Scatophaga stercoraria* and *scybalaria* . . . . feed upon small flies, ..." Again, at a much later date, Prof. Poulton† gave records of the prey of seven specimens of *Scatophaga stercoraria* "as the result of the observations of five observers in several very different

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* 'Introduction to Entomology,' 5th ed. vol. i. p. 275 (1828).—Quoted by Poulton, Trans. Ent. Soc. Lond. 1906, p. 394.

† Trans. Ent. Soc. Lond. 1906, pp. 391–392.

British localities." The victims, all of which were Diptera, were as follows:—*Dilophus febrilis*, L. (Fam. Bibionidæ); *Macronychia viatica*, Mg. = *M. griseola*, Fln. (Tachinidæ); *Stomoxys calcitrans*, L. (Muscidæ); *Sciara carbonaria*, Mg. (Sciaridæ); *Fannia canicularis*, L. (Anthomyidæ); a small "daddy-longlegs," probably *Erioptera* sp. (Limnobiidæ); and *Syrphus punctulatus*, Verr. (Syrphidæ). Prof. Poulton * also recorded three instances of other common British Scatophagids, belonging to as many species (*Scatophaga suilla*, F.; *S. lutaria*, F.; and *S. merdaria*, F.), being taken with prey in their grasp, the names of the victims being respectively *Dicranomyia lutea*, Mg. (Limnobiidæ), *Mydæa urbana*, Mg. (Anthomyidæ), and *Taxonus glabratus*, Fln. (a Hymenopterus insect, belonging to the Family Tenthredinidæ, or Saw-flies). It will be observed that in no single one of these ten cases, whether the captor was *S. stercoraria* or one of its congeners, was the victim a *Calliphora*; and it may be added that in almost every instance the insect preyed upon belonged to a species markedly smaller and less robust than the Dung-fly. Doubtless the latter, when in need of a meal, will seize any fly that it is able to overpower, and it is true that Blow-flies much under the normal size are not uncommon. Nevertbless, the average Blow-fly or Bluebottle, whose well-known buzz is familiar to everyone as the insect cannons up and down the window-pane, so greatly exceeds the average *S. stercoraria* in bulk that its very size, apart from the jerky, impulsive movements characteristic of the species, must serve as a safeguard.

Without in any way pretending to have devoted special attention to the habits of the Yellow Dung-fly, the writer can at least claim to have observed the species for upwards of thirty years, and to have first made its acquaintance long before he became aware of its scientific appellation. In the course of this lengthy acquaintanceship, maintained and periodically renewed in several English counties, chiefly in the Midlands and South Midlands, Dipterous victims have frequently been seen in the clutches of *S. stercoraria*, while the female has often been found enjoying a meal of this kind when the sexes were *in coitû*. In the majority of cases noticed the victim was a small Anthomyid or Bibionid fly, and in no single instance was it a *Calliphora erythrocephala*, Mg., or *C. vomitoria*, L. Now a fly such as *Dilophus febrilis* or a small *Bibio* does not occupy much space, especially when sucked partially dry, and such an insect in the grasp of a well-developed *S. stercoraria* might easily escape observation;

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* *Loc. cit.* p. 391.

but a normal-sized *Calliphora erythrocephala*, after being pounced upon by a Yellow Dung-fly, could hardly pass unnoticed, since such a victim would be much broader and bulkier than its captor. If, therefore, as Prof. Lefroy maintains, *S. stercoraria* is really "a constant and general feeder on the common species of Blow-fly in England throughout the season," the present writer feels his previous ignorance of the fact to be well-nigh inexplicable; otherwise he can only regard his failure to notice even one solitary case in point as due either to singular ill-fortune, or to an invariable purblindness or lack of observation far more reprehensible than anything read of in our youth in the edifying tale of "Eyes and No Eyes." Another reason for doubting whether *S. stercoraria* preys normally and by predilection upon *C. erythrocephala* is that, as a general rule, the two species do not occur together to any extent. Of course, Blow-flies and Yellow Dung-flies may, and doubtless frequently do, encounter each other in certain places, such as in country gardens or on the flower-heads of *Angelica*, *Heracleum*, and other umbelliferous plants in ditches and hedgerows; and no one would wish to deny that under such conditions an occasional Blow-fly may succumb to the rapacity of its yellow-coated neighbour. Generally speaking, however, *Calliphora erythrocephala* does not wander far from human habitations, and is therefore not likely to come very much into contact with *S. stercoraria*, which, as everyone is aware, is most in evidence on cattle-droppings in pasture-fields, practically throughout the year. Even *C. vomitoria*, L., the other British representative of the genus *Calliphora*, does not on the whole haunt the same spots as the Dung-fly.

Turning to the evidence of other observers, Prof. E. B. Poulton, F.R.S., has kindly given permission for the reproduction of the following extract from a letter recently received from him. "Since 1906," writes Prof. Poulton, "further material, somewhat larger in amount, has accumulated in the Hope Department of the University Museum, Oxford, chiefly as the result of the investigations of Mr. A. H. Hamm. The prey, as in the earlier series, consisted of small flies from various groups, Prof. Lefroy's conclusions being partially supported by only a single example—*Scatophaga ordinata* *, with a very small specimen of *Calliphora vomitoria* as its prey (Paignton, April 10, 1914).

"There can be no doubt that the species *Scatophaga*, in the wild state, rarely attack any but small flies, and that they would be useless for the purpose suggested by Prof. Lefroy. Mr. Hamm entirely agrees with this conclusion."

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* A species in which the male is smaller and less hairy than in *S. stercoraria*, L.—E. E. A.

The opinion of Mr. J. E. Collin, F.E.S., a well-known student of and authority upon British Diptera, is precisely the same as that of Prof. Poulton; like the present writer, Mr. Collin has never met with even a solitary case of *Scatophaga* preying upon *Calliphora.*

Finally, Lt.-Col. J. W. Yerbury, whose experience as a collector of our native Diptera is absolutely unique, and who speaks with authority derived from thirty years' observation of predaceous flies in the field, while admitting that such a thing may occasionally happen, has never observed an instance of the Blow-fly being attacked by any species of *Scatophaga*, and therefore considers Prof. Lefroy's assertion to be at variance with facts.

It would appear, then, that if it be possible to discover a natural means of control for the Sheep Blow-fly pest in Australia, we must look elsewhere than to the Yellow Dung-fly to find it. In any case, quite apart from the negative evidence adduced above, which seems to the writer to be reasonably conclusive, it is difficult to understand what advantage could possibly accrue from the introduction into Australia of a British insect, which, though abundant in these islands, is scarcely more so than its supposed victim.

VII.—*The "Cirripede"* Plumulites *in the Middle Ordovician Rocks of Esthonia.*

By Thomas H. Withers, F.G.S.

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Through the researches of F. Schmidt (1881–82), and the later work of E. Koken (1897), J. H. Bonnema (1909), R. S. Bassler (1911), and H. Bekker (1919), the Kuckers Stage (C^2 of Schmidt) of the Middle Ordovician rocks of Esthonia and its fauna, particularly the Gastropoda, Trilobita, Ostracoda, and Polyzoa, are fairly well known. The Kuckers Stage is represented in the neighbourhood of Kuckers, 10 km. N.W. of Jewe Station, Esthonia, by a white or greyish-yellow limestone or marl, with intercalated layers of soft bituminous shale generally of a rusty-brown or amber colour. *Phacops* (*Chasmops*) *odini* is the characteristic fossil, but numerous other Trilobites occur, and there is an abundant fauna of Brachiopods, Gastropods, Orthoceratites, Ostracods, Crinoids, Cystids, and Polyzoa.

So far the genus *Plumulites* has not been recorded from the Kuckers Shale or from Esthonia, although it has a wide geographical distribution and comprises several species ranging through the Ordovician, Silurian, and Devonian rocks. It is but rarely that the plates are found in their natural position, and in consequence most species are known by detached plates only. In many cases the species have been described either under *Turrilepas* or *Plumulites* (see Withers, 1915, p. 122) in the belief that those two genera are synonymous, as indeed they are regarded even in recent text-books.

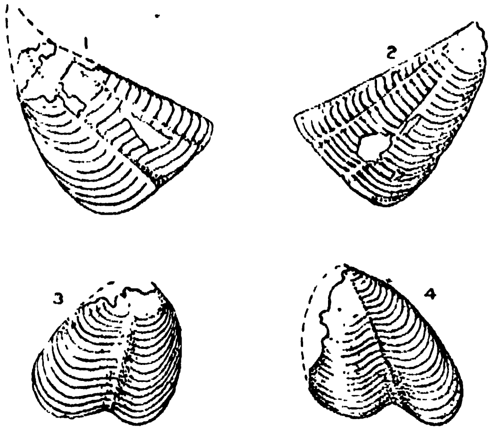
Mr. Bekker has collected and has recently submitted to me thirteen pieces of the bituminous Kuckers Shale on which are exhibited a number of plates which undoubtedly belong to the genus *Plumulites*, s. str., but cannot be referred with our present knowledge to any of the known species.

Genus Plumulites, Barrande.

The shell of this genus was probably blade-shaped and composed of four vertical columns of plates, although in most cases where the shell is at all complete the four columns are flattened and spread out; the plates themselves are extremely thin. The two admedian columns of plates are heart-shaped, and, although flattened out in the fossils, were in life probably bent at an angle along the median fold observable in all these plates; and, although they appear merely to abut along the margin of their inner lobe, they probably overlapped to some extent, but they do not alternate with, or intersect, each other; the outer lobe of each plate intersects the outer plates on either side. The outer kite-shaped plates, as do the admedian plates, overlap each other from behind forward; they are slightly curved distalwards and have a strong narrow median fold, and usually a much narrower submarginal fold on either side; these two latter folds probably mark the position of the plates above and below. Plates in which the apical part is broadly rounded and the growth-lines form a series of rings at the apex ("cancellated" plates of Barrande) have been found associated with the other plates, and these cancellated plates were probably modified plates forming the basal or proximal extremity of the shell.

Plumulites esthonicus, sp. n.

Diagnosis. A *Plumulites* with small plates, the admedian plates under 4 mm. in height, and the outer plates about 6 mm., the growth-lines very closely disposed, 6 to 7 to a millimetre in the outer plates, the admedian plates have the proximal margin deeply excavated in the middle, and the plate is divided into two lobes by a wide and obscure apico-proximal fold, the inner lobe being extremely protuberant from the apex; outer plates with the outer proximal angle broadly rounded, and with the median fold nearer to the outer margin.



Plumulites esthonicus, sp. n.

Figs. 1 & 2.—Outer or "kite-shaped" plates. × 6 diam.
Figs. 3 & 4.—Admedian or "heart-shaped" plates. × 6 diam.

(Figures drawn by Miss G. M. Woodward.)

Horizon and locality. Middle Ordovician, Kuckers Stage (C^2 of Schmidt): Jaerve, nr. Kuckers, 10 km. N.W. of Jewe Station, Esthonia.

Collection. The holotype and one of the figured paratypes (fig. 3) remain in the collection of Mr. H. Bekker, but they will ultimately be presented with other specimens to the Geological Museum of the University of Tartu (Dorpat); the two remaining figured paratypes (figs. 2, 4) and two other specimens have been presented to the Geological Department of the British Museum, registered In. 20588–In. 20591.

Holotype. The outer plate (fig. 1).

Material. Thirteen pieces of shale with several admedian and outer plates.

Description. The plates are all much flattened and imperfect, and are preserved as mere films standing out white on the rusty-brown shale; they are of two kinds, the admedian heart-shaped plates and the outer kite-shaped plates. None of the so-called "cancellated" plates have been noticed.

Admedian plates roughly heart-shaped, broad, short, subtriangular, with the apex directed inwards, and a rather wide ill-defined fold extending from the apex to the excavated portion of the proximal margin, the largest plate having a height of 3·8 mm. Proximal margin sinuous, the middle portion deeply excavated; inner (fixed) margin rounded and markedly protuberant from the apex, much more so than is the outer margin. The growth-lines are very closely disposed, in some measure no doubt due to crushing, and they are directed upwards on the margins, but to a greater extent on the inner margin.

Outer plates kite-shaped, somewhat curved distally with pointed apex, and a narrow submedian fold extending the whole length of the plate and situated slightly nearer to the outer margin, and there is a similar but narrower fold near and parallel to the inner margin. The proximal margin is slightly sinuous, being slightly excavated in the middle, the outer proximal angle is broadly and regularly rounded, and the inner proximal angle narrowly rounded; inner margin very slightly concave, the proximal half almost straight; outer margin slightly convex. Growth-lines closely disposed, 6–7 to a millimetre, equidistant, crossing the median apico-proximal fold at right angles, slightly concave on the inner half of the plate and a little upturned at the inner margin, and on the outer half they are broadly curved upwards, and towards the outer margin are more crowded together.

Remarks, and comparison with other species. The detached plates of *Plumulites* are readily distinguished from the probably homologous admedian and outer plates of *Turrilepas*. In *Turrilepas* the plates are much thicker, the admedian plates have more laterally produced lobes and are consequently more saddle-shaped, and the outer plates are not acutely tapering at the apex, nor have they the median longitudinal fold so characteristic of the outer plates of *Plumulites*.

Plumulites esthonicus appears to agree most closely with *P. rastritum*, Moberg (1914, p. 493, figs. 7, 8), from the Ordovician (*Rastrites skiffer*) of Sweden, and *P. peachi*, Nicholson & Etheridge (1880, p. 301, pl. xx. figs. 8–10; also Reed, 1908, p. 519, pl., figs. 1–5), from the Upper Ordovician (Ardmillan Series) of Scotland. From *P. rastritum* it differs in the admedian plates by the more rounded and protuberant inner lobe, and in the outer plates by the longitudinal fold being nearer to the outer margin instead of to the inner margin. From *P. peachi* the admedian plates differ in having the inner lobe more protuberant, the margin being more fully rounded to the apex, and in the outer plates the growth-lines of the outer lobe are more regularly curved and consequently the outer proximal angle is more regularly rounded; the growth-lines are more closely disposed, and none of the known plates attain to more than one-third the size of the largest-known plates of *P. peachi*.

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VIII.—*A new Bank-Vole from Esthonia.*

By MARTIN A. C. HINTON.

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THE small mammals of Esthonia are no doubt similar, in a general way, to those inhabiting one or other of the neighbouring countries bordering upon the Baltic. But hitherto we have had little or no material from this portion of the Baltic coast, and therefore have lacked the means of determining precisely what forms invade, or, it may be, are peculiar to, Esthonian territory. This gap in our knowledge will, however, in all probability, be filled in the near future; for Mr. E. Reinwaldt, of the University of Dorpat, has now begun the systematic collection and study of the mammals of his native land, and results of considerable interest may be expected to flow from his work in due course.

Among some specimens presented to the British Museum by Mr. Reinwaldt are three examples of the local form of the widely distributed *Evotomys glareolus*. Judging from these specimens the Esthonian bank-vole is immediately distinguishable from all other western European subspecies of *E. glareolus* by its exceptionally dark coloration. Placed among the skins of other forms, such as *E. g. suecicus* and *E. g. glareolus*, and viewed casually, the backs of these Esthonian specimens appear to be quite dusky; but closer inspection shows that they have the characteristic rufous mantle normally developed, though darkened or subdued. In other respects these specimens agree best, and indeed closely, with *E. g. suecicus*, although the skulls have their own slight peculiarities. I am greatly indebted to Mr. Reinwaldt for so kindly permitting me to describe this well-marked geographical race.

Evotomys glareolus reinwaldti, subsp. n.

Most like *E. g. suecicus* in general character, but colour much darker.

Upper parts clothed with a fine mixture of dark reddish-brown and dusky hair-tips, the general effect produced, where brightest (as between ears and on nape), being no brighter than the "chestnut" of Ridgway; darkest on rump, where the elimination of rufous hair-tips leaves the colour dark slaty-grey. Rufous tinge traceable far back towards rump and far down flanks. Underparts silvery grey, much darkened by the slaty bases of the hairs. Ears dusky. Tail dusky above; its lower surface, together with the hands and feet, dirty white.

Skull very similar to that of *E. g. suecicus* in size and general appearance; zygomatic arches slightly less expanded; bullæ slightly smaller and less inflated. Teeth normal; m^3 without a third re-entrant fold on inner side in any of the three specimens examined; in *E. g. suecicus*, Miller ('Catalogue,' p. 31) found this fold to be present in about one-third of the individuals.

Type. Adult female. B.M. No. 20. 11. 6. 4. Original No. 306. Collected by Mr. E. Reinwaldt, 11th August, 1920, at Hapsal, Esthonia. "In Obst- und Gemüsegarten."

Hab. Esthonia.

Measurements of the type, taken in the flesh by the collector (and of two other specimens ♂ and ♀ in parentheses):—Head and body 98 (91, 100) mm.; tail (without hairs), 49 (44·5, 46); hind foot (without claws), 17 (18, 17·5); ear 14 (13, 14).

Skull-measurements of type (and of ♂ and ♀ in parentheses):—Condylo-basal length 23 (23·2, 23·2) mm.; zygomatic breadth 12·6 (12·5, 12·6); interorbital constriction 3·7 (3·9, 3·7); occiput, breadth × depth 10·6 × 5·9 (10·6 × 6, 10·6 × 6·1); nasals 6·3 × 2·6 (6·2 × 2·6, 6·6 × 2·7); dental length 12·9 (13, 13·2); cheek-teeth (alveolar length) 5·1 (5·3, 5·2).

IX.—*The Klipspringers of Rhodesia, Angola, and Northern Nigeria.* By MARTIN A. C. HINTON.

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OWING largely to its peculiar station and habits, the Klipspringer, among African antelopes, shows quite a special tendency to develop geographical and, in part, perhaps, merely colonial races. The range of *Oreotragus* extends over the whole of Africa south of the Sahara, from Northern Nigeria and Somaliland to the Cape. Within this wide area, however, its distribution is markedly discontinuous, the animal being restricted to the mountainous districts. Thus it is absent from the great Congo forest region; while, in the more open country of East Africa, the lowlands intervening between one "Inselberg" and another form, in all cases where their breadth exceeds a few miles, decided barriers to inter-colonial communication.

Eight distinct forms have been recognized hitherto; and to these I have now to add three, described below. As regards the status of these forms, several of them have been accorded full specific rank by their describers. In the 'Catalogue of Ungulates' (vol. ii. p. 125) Lydekker and Blaine treat them all as subspecies of *O. oreotragus*, originally described from Cape Colony. Since these forms are strictly vicarious, and since the material available is far from being sufficient to enable one to form a sound judgment upon the question of their inter-relationships, this seems to be the proper course.

One of the most interesting subspecies is *O. o. aceratos*, described (as a species) from the Lindi Hinterland, in the southern part of "German East Africa" (now Tanganyika Territory), by Noack* and later by Neumann†. While in all other subspecies hitherto described (with the exception of *O. o. aureus*, Heller) the general colour of the dorsal surface is dull and uniform, in *aceratos* it is bright, and there is, according to the published descriptions, a marked contrast between the fore and hind parts. The fore-parts are unusually brightly coloured, reddish or ochraceous; the hind-parts grey or "roe-coloured." The material now before me, appertaining to *aceratos* and to the allied forms described below from Rhodesia and Angola, bears out the original descriptions, in so far as the brilliant coloration of the fore-parts is concerned. But, as regards the loins and rump, while some of the specimens have these regions grey and contrasted, in others the bright tints, in a diminishing degree of intensity, may be traced backwards almost or quite to the rump. The material (in part undated) does not allow one to decide whether this variation is seasonal, sexual, or merely individual; but I am inclined to think that when the coat is first assumed in *aceratos* and similar subspecies, it is bright-coloured throughout, and that later on the particoloured appearance of the back is produced by bleaching of the ochraceous rings of the hairs clothing the rump and loins.

Until recently the only specimens representing *aceratos* in the Museum were some from the neighbourhood of Zomba, Nyasaland, and from Southern Angoniland, which had been identified with Noack's animal by Neumann. Some specimens from the Chinsali District of North-eastern Rhodesia have also been referred by Lydekker and Blaine to *aceratos*.

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* Zool. Anz. xxii. p. 11 (1899).

† S.-B. Ges. natf. Fr. Berlin, 1902, p. 169.

Major C. H. B. Grant has now kindly presented three topotypical examples, two males and a female, collected by him in the Lindi District in July 1919. On comparing these with the specimens from the Chinsali District, the latter are immediately seen to differ by their richer and deeper coloration. The Rhodesian animal may therefore be described as

Oreotragus oreotragus centralis, subsp. n.

Like *O. o. aceratos*, but general colour of upper parts deeper and richer.

Upper surface of head, neck, and back bright, deep ochraceous in general colour, the tint differing from that seen in the corresponding parts of *aceratos* to the extent of the difference between the "ochraceous buff" and the "raw sienna" of Ridgway; the colour is most intense upon the nape and over the shoulders. Rump, in some specimens, grey, like the outer parts of the thighs, in others more or less invaded by the ochraceous tint of the fore parts. No white preorbital patches upon the face (these being conspicuous in *aceratos*). Upper surface of muzzle dusky; top of head between and in front of ears irregularly blackened. Ears as in *aceratos*, but the white patch on each proectote smaller. Under surface white, save for the broad ochraceous collar. Dorsal surfaces of limbs grey, somewhat darker than in *aceratos*; the dusky hoof-patches slightly more extensive.

Skull not peculiar; females hornless.

Type. An adult male. B.M. no. 7. 11. 15. 6. Collected in the South Chinsali District and presented to the British Museum by Mr. R. L. Harger.

Hab. North-east Rhodesia.

Unfortunately none of the four specimens from the type-locality is dated. The examples in the collection from Zomba and the Mlanje Mountains are intermediate between *aceratos* and *centralis*; in general colour they approach the former, but in the characters of the face and ears they more nearly resemble *centralis*. Possibly these two subspecies intergrade in the country to the south of Lake Nyasa.

On the west coast, in Angola, another subspecies, apparently allied to *aceratos*, has been discovered. This may be described as

Oreotragus oreotragus tyleri, subsp. n.

A light-coloured representative of *O. o. aceratos*; without dark hoof-patches.

General colour of upper parts as in *aceratos*, but noticeably lighter. No white patches on face, the preorbital region and top of the muzzle being light buff. No black evident upon the forehead. Ears much lighter, pale ochraceous at the base; outer half of the proectote white; dark ground of the remainder of the ectote almost hidden by the buff "lining" hairs, only its margin appearing dusky; entote cream. Dorsal surfaces of fore limbs pale buff, becoming greyish over the cannon-bone; of hind limbs light grey. No dark patches above the hoofs, the regions normally occupied by these patches lighter and clearer than elsewhere.

Skull normal; female without horns.

Type. An adult male. B.M. no. 20. 12. 8. 2. Collected at Esquimina, south of Benguela, on the coast of Angola, and presented to the Museum by Mr. F. Tyler Thompson.

Hab. Coastal district of Angola.

The subspecies is very clearly distinguished from the related forms by its pale colour, the characters of the face and ears, and by the absence of dark patches above the hoofs. I have much pleasure in naming it after Mr. F. Tyler Thompson, who is well known to all sportsmen and others familiar with Angola.

In 1911, Lydekker called attention to the presence of Klipspringers in Northern Nigeria; and on the basis of a skull received from Dr. Porteous and stated to have come from the Duchi 'n-Wai Range, in the province of Zaria, he described a new subspecies, "*O. saltator porteusi*" (P. Z. S. 1911, 2, p. 960). In the 'Catalogue of Ungulates' the name is corrected, and appears as *O. oreotragus porteousi*. The external characters of this form are unknown.

In 1913, Mr. Hyatt presented the skin and skull of a male collected by him at Leri 'n-Duchi, N.E. Zaria Province; and in the following year the Museum received from the same donor the skin of a female collected at a point 50 miles E. of Zaria. The male is in somewhat faded pelage, but making due allowance for this, there is such close agreement between the two skins that there can be no doubt that both belong to one and the same subspecies. On comparing the skull of the male with the type and only specimen of *porteousi*, such marked differences are seen that I do not think it possible to identify Mr. Hyatt's specimens with the form described by Lydekker. The latter must, in my opinion, have come either from some other part of the Duchi 'n-Wai Range, or, what is more probable (having regard to the fact that "Yola," instead of "Zaria," was named in the original description), from one of the hills of the Bautchi Highlands further to the east. I therefore venture to describe Mr. Hyatt's Klipspringer as a distinct subspecies :—

Oreotragus oreotragus hyatti, subsp. n.

Resembling *O. o. centralis* in general outward appearance; skull normal.

General colour of upper parts deep ochraceous, about as in *O. o. centralis*. Eye-rings and preorbital portion of face (with the exception of a narrow, median, darker area on top of muzzle) pale, yellowish-white or grey. Ears without white spot on proectote; the dusky ground of the ectote concealed in great measure by ochraceous "lining" hairs. Top of head not blackened. Limbs grey dorsally; no dark patches above hoofs of fore limbs; inconspicuous dark hoof-patches on hind limbs.

Skull and horns quite normal; differing from that of *O. o. porteousi* conspicuously in the much shorter and broader nasals, larger teeth, and narrower (normal) frontals.

Measurements of type-skull, with those of the type of *porteousi* in parentheses:—Extreme length 140 (139); cranial breadth 51 (51); width across orbits 74 (81·5); nasals, length × least width 33·5 × 15 (46 × 13·5); p^2-m^3 53 (47·5) mm.

Type. An adult male. B.M. no. 13. 3. 8. 2. Collected at Leri 'n-Duchi, N.E. Zaria Province, N. Nigeria, and presented to the British Museum by Mr. M. P. Hyatt.

Hab. Zaria Province, North Nigeria.

While presenting a close general resemblance to *centralis*, *O. o. hyatti* is sufficiently and clearly distinguished from the Rhodesian subspecies by the characters of the face and ears. It is much to be hoped that further, properly dated, material will be procured from Nigeria, for it seems not improbable that *porteousi* and *hyatti* represent two perfectly distinct species. In preparing this paper, I have worked through all the skulls of *Oreotragus* in the collection; but, apart from the presence of horns in the females of the East African *O. o. schillingsi*, I have found no cranial characters by which the various subspecies can be distinguished, except in these two Nigerian forms. Of them, *hyatti* agrees perfectly in skull-form with the normal subspecies of *O. oreotragus*, while *porteousi* differs from all.

X.—*The Geographical Races of* Herpestes brachyurus, *Gray*. By OLDFIELD THOMAS.

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HERPESTES BRACHYURUS was originally described on a specimen coming from Malacca, and examples from Sumatra and Borneo have since been referred to the same species. A study of the material now available shows that while they seem to be all rightly referred to *H. brachyurus*—being alike in all their more essential characters,—yet that they may be separated into four geographical races, one each from the Malay Peninsula and Sumatra and two from Borneo.

Nearly allied to *H. brachyurus* is the *H. semitorquatus* of Borneo, with a longer tail, redder coloration, a light but variable mark on the side of the neck, and lighter dentition, the anterior upper molar especially being without the marked thickening of the anterior side of the inner lobe nearly always found in *H. brachyurus*.

The subspecies which I should recognise may be distinguished as follows:—

A. Hairs of anterior part of chest and lower neck of irregular direction, grizzled greyish and buffy.	
a. Upper surface coarsely and prominently ticked with buffy whitish. Belly brown with some light tickings. (Malacca.)	*H. b. brachyurus.*
b. Upper surface blackish, with scarcely any tickings. Belly black. (Sumatra.)........	*H. b. sumatrius.*
B. Hairs of anterior chest and lower neck definitely directed forwards, blackish, in continuity with the prominently black belly.	
c. Colour dull blackish olivaceous, without rufous suffusion. Skull of normal shape. (Northern Borneo; Sarawak (lowlands).)............	*H. b. rajah.*
d. Colour more or less suffused with rufous, especially on head and throat. Skull shortened, with unusual zygomatic spread. (Mountainous region of E. Sarawak.)	*H. b. dyacorum.*

Details of new forms:—

Herpestes brachyurus sumatrius.

Apparently less robust than true *brachyurus*, but the only specimen available is a female. General colour above blackish brown, with comparatively few of the light buffy-whitish tickings found in *brachyurus*. Belly blackish, but anteriorly this colour changes abruptly to grizzled buffy greyish on the neck, throat, and chin; the hairs of the lower neck irregular in direction, as in *brachyurus*. Legs, feet, and tail blackish brown.

Skull of normal shape, with comparatively long muzzle. In the type the breadth across the outer corners of pm^4 does not exceed the length of the premolar-molar series. Teeth comparatively light and delicate, the usual thickening of the inner lobe of m^1 at a minimum.

Dimensions of the type:—

Hind foot (s. u.) (wet) 79 mm. Skull, gnathion to back of bulla 82; zygomatic breadth 48·5; front of canine to back of m^2 33; breadth between outer corners of carnassial 27·5; length of carnassial on outer edge 7·8.

Hab. Sumatra. Type from Deli.

Type. Adult female. B.M. no. 90. 1. 20. 2. Collected 3rd November, 1888, by Mr. Iverson. Received in exchange from the Christiania Museum.

Herpestes brachyurus rajah.

General colour dark blackish olivaceous, profusely ticked with the minute subterminal buffy rings on the hairs. Belly black, without lighter tickings, this colour running forward anteriorly along the lower side of the neck nearly to the level of the ears, the hairs in this anterior region being all definitely directed forwards. Head dull brown, interramia lighter, but neither with any suffusion of rufous or ochraceous. Tail coarsely grizzled black and pale buffy.

Skull of normal shape; teeth of medium stoutness, decidedly heavier than in *sumatrius*.

Dimensions of type:—

Hind foot (dry) 80 mm. Skull: condylo-basal length 84·5; zygomatic breadth 46·5; maxillary tooth-row 33; breadth between outer corners of carnassials 28·5; length of carnassial on outer edge 8·4.

Hab. Sarawak. Type from Balinean, in lowlands.

Type. Adult female. B.M. no. 5. 3. 1. 8. Original number 16. Collected March 1903, and presented by Herbert C. Robinson, Esq. Other specimens received in 1876 from Mr. H. Low, and in 1878 from Governor H. T. Ussher.

Herpestes brachyurus dyacorum.

General coloration as in *rajah*, but the whole more or less suffused with rufous or ochraceous, the pale rings on the dorsal hairs of the latter colour. Belly black, though with a certain number of light ticked hairs, the dark colour running forward on to the lower neck as in *rajah*, and the hairs being similarly directed forwards. Head dark rufous-brown, inter-ramia and throat dull drabby or rufous; a tendency for an ill-defined lateral line on the neck to be of this latter colour. Tail broadly grizzled with black and dull buffy.

Skull strongly built, usually with peculiarly shortened muzzle and widely expanded zygomata. Teeth stout and heavy, often very much so, the thickening of the inner lobe of m^1 at a maximum.

Dimensions of the type:—

Hind foot (dry) 81 mm. Skull: condylo-basal length 88; zygomatic breadth 55; maxillary tooth-row 33; breadth between outer corners of carnassials 30; length of carnassial on outer edge 8·3.

Hab. Mountainous region of Eastern Sarawak, notably the Baram district. Type from Mt. Dulit.

Type. Old male. B.M. no. 99. 12. 9. 26. Collected 17th December, 1896, and presented by Dr. Charles Hose. Four specimens examined.

The Bornean material in the Museum seems to indicate clearly that two races of *H. brachyurus* occur there, the one olivaceous blackish without warmer suffusion, and the other more or less rufous or ochraceous. And, so far as exactly labelled specimens are concerned, the former is a lowland and the latter a mountain race. But far more specimens with exact localities are needed before the respective ranges of the two forms can be made out.

XI.—*A new Genus of Opossum from Southern Patagonia.*

By Oldfield Thomas.

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Among some small mammals collected by Mr. T. H. Hall at Cape Tres Puntas, on the east coast of Southern Patagonia, in south latitude 47°, there occurs, most unexpectedly, a small opossum, this locality being far to the south of any hitherto recorded for the family, the previously known southern limit having been the Island of Chiloe, 42°–43° S. The collection was sent by Mr. Hall to the Perth Museum, Western Australia, whence it has been transferred by exchange to the British Museum.

The opossum is a small animal, externally very like the Chilian opossum, *Marmosa elegans*, but close examination reveals so many differences from that as from other members of the family, that a distinct genus should apparently be formed for its reception.

From its far southern habitat this might be called

NOTODELPHYS, gen. nov.

Allied to *Marmosa*, but of a more predaceous type, the modifications of the skull being all those associated with greater biting-power.

External characters about as in *Marmosa* (subgenus *Thylamys*). Feet proportionally more bulky. Ears and tail comparatively short, the latter incrassated.

Skull with shortened muzzle and widely spread zygomatic arches. The shortening of the muzzle, as compared with *Marmosa*, is closely parallel to that in *Dasyurus* as compared with *Phascogale*, occurring in the premolar region, and being obviously for the increase of the biting-power. Nasals expanded in their posterior third, the hinder extension not of great length. Interorbital region short, its edges quite without ridges, though there is just an indication of post-orbital knobs. Brain-case smooth, the lambdoid ridges very small. Palate imperfect opposite the first three molariform teeth. Bullæ of medium size. Lower jaw strongly bowed below, the front edge of the coronoid nearly vertical.

Upper incisors as in *Marmosa*, the first pair not longer than the others. Canines remarkably long, slender, little curved. Premolariform teeth evenly increasing backwards, but all small in proportion to the size of the skull, and set closely together, their combined length barely exceeding that of two of the larger molars, while in *Marmosa* and other opossums the length of the three anterior premolars approximately equals that of three of the molariform teeth. Molars proportionally large and heavy, their breadth about half that of the palatal space between them.

Lower incisors small, closely set, the two median ones touching each other, and the outer ones pressed for their whole length against the canines behind them. Canines long, nearly vertical, much less proclivous than in *Marmosa*. Molariform teeth large, their anterior outer cingulum unusually strongly developed.

Genotype:—

Notodelphys halli, sp. n.

General appearance not unlike that of *Marmosa elegans*. Fur not very long, but fine and close. General colour very much as in grey examples of *M. elegans*, with a dark grey dorsal area and lighter sides. Dark shoulder and hip patches present. Under surface uniformly white to the bases of the hairs. Cheeks and a patch over eyes whitish. Ears short, rounded, flesh-coloured, a whitish patch at their bases posteriorly. Feet markedly more robust than in *Marmosa,* probably more fossorial; claw of pollex, as with the other digits, extending far beyond the soft terminal pad; in *Marmosa* it is markedly shorter than the others, and does not extend beyond the pad. Forearms and hands, ankles and feet pure white. Tail much shorter than head and body, strongly incrassated, furry like the body for three-fourths of an inch at base, then thickly clothed with short fine hairs; dark greyish brown above, whitish below and at the end.

Skull and teeth as above described.

Dimensions of the type, the external ones merely approximate:—

Head and body 144 mm.; tail 93; hind foot (wet) 16; ear (wet) 18.

Skull: greatest length 31·2; condylo-basal length 31; zygomatic breadth 20; nasals, length 13·3, middle breadth 2·7, greatest breadth 4; intertemporal breadth 5·7; breadth of brain-case 13; palatal length 17; breadth outside m^3 11·4; diameter of bulla 3·4; maxillary tooth-row 13; height of canine 4·2; three premolariform teeth 4·5; three anterior molariform teeth 6·2; oblique breadth of m^2 3·3.

Hab. Cape Tres Puntas, S.E. Patagonia, 47° S.

Type. Adult male. B.M. No. 21. 6. 7. 19. Original number 208. Collected by Mr. T. H. Hall. Received in exchange from the Perth Museum, Western Australia. One specimen.

This interesting little opossum, the most southern marsupial in the world, appears, from the structure of its skull, to be of a more carnivorous and predaceous nature than any of the other small members of the family. Ordinary Marmosas feed mainly on insects and fruit, and as insects are rare and fruit almost non-existent in its far-southern habitat, this opossum has had to acquire peculiar habits, and no doubt lives largely on mice and small birds.

As already indicated, the animal has the shortened muzzle that gives increased biting-power, a modification connected with this purpose throughout the Mammalia, and particularly parallel to that of *Dasyurus* as compared with *Phascogale,* even though the premolars have not in this case been reduced in number.

Besides its shortened premolar region, *Notodelphys* may be distinguished from other allied opossums by its long slender canines, its heavy molars, its short smooth-edged interorbital space, and widely expanded zygomata.

Mr. Hall is to be congratulated on the very interesting discovery he has made, and I have much pleasure in connecting his name with the species.

XII.—*A new Bat of the Genus* Promops *from Peru.*

By OLDFIELD THOMAS.

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THE British Museum owes to Mr. J. F. Davison, the donor and collector of several interesting European voles described by Mr. Gerrit Miller, two bats of the genus *Promops* recently captured by him at Chosica, Peru. They belong to the genus *Promops*, of which I gave a short classification in 1915 *, but are not assignable to any species there recognized. The new form may be called—

Promops davisoni, sp. n.

Size intermediate between *P. occultus* and *P. fosteri*, both of Paraguay. Colour dark chocolate-brown, with lighter bases to the hairs, very much as in *P. fosteri*. Wings as long as in *P. occultus*.

Skull smaller than that of *P. occultus*, of about the same proportions; larger than that of *P. fosteri*, the brain-case not so unusually swollen as in that species.

Forearm of type 51·5 mm.; third metacarpal 55 mm.

Skull: greatest length 19·2; condyle to front of canine 17·6; maxillary tooth-row 7·4; m^1 and m^2 on outer edge 3·8.

Hab. Department of Lima, Peru. Type from Chosica, 2700′.

Type. Adult male. B.M. no. 21. 5. 21. 1. Original number 207. Collected 3rd March, 1921, and presented by J. F. Davison, Esq. Two specimens.

The species of *Promops* being mainly determinable by the dimensions of their skulls and teeth, this new species may be readily distinguished by the measurements above given. No member of the genus as now restricted has been previously recorded from Peru.

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* Ann. & Mag. Nat. Hist. (8) xvi. p. 61.

XIII.—*On Spiny Rats of the* Proechimys *Group from South-eastern Brazil.* By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

THE spiny rats referable to *Proechimys* that occur in South-eastern Brazil, Bahia, Rio Janeiro, &c., have for long been in an excessive state of confusion, mainly owing to the fact that the species to which the earlier names—*setosus*, *myosurus*, *albispinus*, and others—were applicable had never been properly identified.

Now, however, I have been through the material in the British Museum, and, in addition, have had the advantage, by the kindness of Dr. R. Anthony, of examining the typical skulls of *Echimys setosus*, Desm., and *E. albispinus*, I. Geoff., while Dr. Winge has given me information about *Loncheres elegans*, Lund. Furthermore, Dr. Bedot and M. Revilliod, of Geneva, have been so good as to lend me two additional examples representing the original *E. albispinus* of Bahia.

The species that occur in the area referred to prove to be no less than five in number, and they belong to two very distinct groups, which may be considered as of subgeneric importance—namely, *Proechimys*, s. s., and *Trinomys*, subg. n. The primary distinction between these lies in the number of laminæ present in the cheek-teeth—four in *Proechimys*, three in *Trinomys*,—while, in addition, the skull of *Trinomys* is less elongate, with shorter muzzle, less-developed supra-orbital and parietal ridges, and orthodont or slightly proodont incisors, as compared with the opisthodont incisors of *Proechimys*. In all characters, however, the species grade too much into one another to consider the groups as genera, especially as the most important point, the number of the tooth laminæ, has a curious exception—*Proechimys vacillator*, which, as explained in the original description, has a variable number of its cheek-teeth trilaminate, while it is in all other respects typically *Proechimys*, with long skull, strong ridges, and opisthodont incisors; and in any case p^4 is always quadrilaminate. *P. albispinus*, as being the most extreme, may be considered the genotype of *Trinomys*.

The five species of the area, with the addition of a new subspecies to *P. albispinus*, may be sorted as follows:—

A. With 4 laminæ to cheek-teeth.—*Proechimys*, s. s.

a. Skull with strong ridges and post-orbital angles. Palatal notch to middle of m^1. (Minas Geraes.) .. 1. *roberti*, Thos.

b. Brain-case little ridged, and without strong postorbital angles. Palatal notch to middle of *m*^{2}.
  a^2. Larger; skull about 54 mm. Supraorbital edges scarcely beaded. Pterygoids spatulate. (São Sebastião Island, São Paulo.) 2. *iheringi*, Thos.
  b^2. Smaller; skull about 51 mm. Supraorbital edges beaded. Pterygoids linear. (S.W. Rio Janeiro.) .... 3. *dimidiatus*, Günth.
B. With 3 laminæ to cheek-teeth.—Subgenus *Trinomys*.
  c. Palatal notch to middle of *m*^{2}. Tail with white terminal pencil. (Bahia and Minas Geraes.) ...... 4. *setosus*, Desm.
  d. Palatal notch to front of *m*^{2}. Tail dark above to end. (Bahia Province.)........................ 5. *albispinus*, I. Geoff.
    c^2. Sides reddish. Skull more slender. Incisors orthodont, 86°. (Madre de Dios Island, Bahia Bay.) .. 5 *a. albispinus albispinus.*
    d^2. Sides brown. Skull broader and shorter. Incisors more proodont 93 96°. (Lamarão, Bahia.) .. 5 *b. a. sertonius*, subsp. n.

Details about *P. roberti* and *iheringi* will be found in the original descriptions of those species.

P. dimidiatus was described by Günther * as an immature specimen without locality, presented by Lord Derby (B.M. no. 51. 7. 21. 24). We know that its donor did obtain a number of specimens from Rio Janeiro, and the skull agrees so closely with those of two examples from Itatiaya, near to the Rio–Minas frontier, collected and presented by Prof. J. P. Hill, that I have no hesitation in referring the latter to Günther's species.

"*Echimys setosus*, Desm.," was the first described of the group, but was ignored by the other early writers, who contributed synonyms to it as follows:—*myosuros*, Licht., 1820; *leptosoma*, Bts., 1827; *cinnamomeus*, Licht., 1830; *elegans*, Lund, 1841; and *fuliginosus*, Wagn., 1842. The characteristic white end to the tail is mentioned in connection with most of these, and there does not seem to be any doubt as to their reference. The typical skull, now in the Paris Museum (No. A. 7787), though very imperfect, shows clearly the trilaminate teeth characteristic of *Trinomys*, and has its palatal notch only penetrating to the middle of *m*^{2}. Specimens corresponding to this animal have been obtained at Lagoa Santa, Minas, by Lund and others, and at "Bahia," whence

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* P. Z. S. 1876, p. 747.

myosuros was described. The names *leptosoma* and *cinnamomeus* were mere renamings of *myosuros*. If, however, Lagoa Santa specimens should ultimately prove different from those of Bahia—and perhaps they are browner and less rufous, though the indifferent material does not suffice to prove it,—they should bear the name of *elegans*, Lund, with synonym *fuliginosus*, leaving *setosus* for the Bahian animal.

The type of *E. albispinus*, I. Geoff., came from Deos Island (=Madre de Dios), Bay of Bahia. Its skull is in the Paris Museum (No. A. 7669) and is practically perfect. The two specimens (327/2, 327/3) from Geneva, which were among those referred to by Pictet * as being true *albispinus*, also show clearly the characters of the species.

Finally, the Museum contains a fine series of an allied form obtained by M. Robert at Lamarão, also in Bahia, but in the highlands of the "sertão" further to the north. It is on this series that I have been able to observe the various characters of the subgenus *Trinomys*. The form may be briefly described as follows:—

Proechimys albispinus sertonius, subsp. n.

Size about as in *albispinus*. General colour above lined brown; the fore back with buffy hairs which show through on the surface; the hinder back blackish brown, this colour arising from the dark ends of the spines. Sides not more buffy or rufous than back—in fact, less so; while the type of *albispinus* was stated to have strongly buffy sides, such as are found in old specimens of *setosus*, as has also the normal coloured Pictet specimen received from Geneva, the other being an albino. Sides of body, rump, and thighs with numerous prominent white-ended spines. Under surface, hands, and feet white. Tail dark brown, nearly black, for its whole length above; whitish below; not pencilled.

Skull short and squat, with broad muzzle; the breadth between the two lacrymal bones decidedly greater than in true *albispinus*. Supraorbital ridges well marked, but not extending on to parietals. Palatal foramina short, fusiform. Palatal notch very narrow, acute-angled, reaching forwards to the level of the front edge of m^2. Hamular processes of pterygoids narrow, but not absolutely linear. Bullæ rather small.

Incisors more proodont than in other members of the group, the index of the type 93°, and in some specimens attaining 96°; that of the type of *albispinus* 86° and of the two Geneva specimens 86°–87°.

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* Anim. Nouv. Genev. p. 2 (1841).

Dimensions of the type (measured in the flesh):—

Head and body 190 mm.; tail 170; hind foot 36; ear 23.

Skull: greatest length 46·4; condylo-incisive length 41·4; zygomatic breadth 25; nasals 16·5; interorbital breadth 10·5; palatilar length 17; palatal foramina 3·8 × 2; upper tooth-series (crowns) 7·6.

Hab. Lamarão, Bahia, about 70 miles north of Bahia City. Alt. 300 m.

Type. Adult male. B.M. no. 3. 9. 5. 86. Original number 1503. Collected 16th June, 1903, by Alphonse Robert. Presented by Oldfield Thomas. Fourteen specimens.

"Inhabits the catinga forest."—*A. R.*

This subspecies differs from true *albispinus* by its less rufous sides, its shorter broader-faced skull, and its more proodont incisors. The hind foot of *albispinus* was described by Geoffroy as being 45 mm. in length, but Dr. Anthony informs me that this was an error, and that the hind foot of the type only measures 38 mm. (c. u.), 35 mm. (s. u.), while the two Geneva specimens also only have the hind foot 36–37 mm. (s. u.). In this respect, therefore, there is no difference between *albispinus* and *sertonius*.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

March 9th, 1921.—Mr. R. D. Oldham, F.R.S.,
President, in the Chair.

The following communication was read:—

'The Bala Country: its Structure and Rock-Succession. By Miss Gertrude Lilian Elles, M.B.E., D.Sc., F.G.S.

The lithological and faunal sequence is as follows:—

	Shelly faunas.	Graptolitic faunas.
Cwm yr Æthon Shales.		Zone of *Monograptus crispus*. Zone of *Monograptus sedgwicki*.
Hirnant Grits and Mudstones, 300 feet, with local Hirnant Limestone.	*Orthis-hirnantensis* fauna.	
Moel-y-Ddinas Mudstones, about 250 feet.	*Phacops-mucronatus* fauna.	
Moel-Fryn Sandstones, at least 1000 feet.		
Rhiwlas Limestones and Mudstones.	*Phillipsinella-parabola* fauna.	

CARADOCIAN.	Gelli-Grin Calcareous Ash, 100 feet, with Gelli-Grin Moel-Fryn, Bryn-Pig, & Caerhafotty Limestones.		(a) *Chasmops* and *Orthis (Nicolella) actoniae* sub-fauna.	
	Pont-y-Ceunant Ash, maximum 25 feet.			
	Allt-ddwr Mudstones, with thin limestones, 1300 feet.		(b) *Asaphus-powisi* and *Heterorthis alternata* sub-fauna.	Zone of *Dicranograptus clingani.*
	Fronderew Ash, 12 feet.			
	Glyn-Gower Sandstones, with thin limestones, 1100 feet.			
LLANDEILIAN.	Nant-hir Shales and Derfel Limestone.	Caly	*Dicranograptus* Shales.	
				Zone of *Climacograptus peltifer* or *Nemagraptus gracilis.*

The so-called 'Bala Limestone' is merely one of a series of limestone lenticles occurring within the Calcareous Ash at different horizons. The base of the Ashgillian appears to be calcareous everywhere west of a definite north-and-south line. There has been some confusion between the Rhiwlas Limestone and the limestones in the Calcareous Ash; but at Bryn Pig, where both are seen together in vertical section, the lithological and faunal differences are manifest.

The detailed mapping of the beds, as now classified, has brought out the structure of the country more completely than was hitherto possible, and a modification of views previously held with regard to the Bala Fault seems to be necessary. It appears to be one of a series of compressional faults affecting the whole of the country south-east of Bala Lake.

The initiating structural factor was probably compression of the rocks as a whole against the Harlech Dome, controlled by the resistance offered by the Ordovician volcanic mass to the compressional force, which affects the detail of the structure of the whole country lying east and south-east of it. The country was first folded, and then affected by thrust-movements. There are six main structural lines of displacement:—(1) The Llyn-Tegid line; (2) the Bala-Lake line; (3) the Llangower line; (4) the Cefn-ddwy Graig line; (5) the Moel-Fryn line; and (6) the Fridd-defaid line.

Combined with these major displacements, there has been much differential minor thrusting (tears), which is most conspicuous above the Llangower thrust. The effect of this thrusting diminishes steadily from west to east, and in the Hirnant Valley the beds are being compressed without any faulting.

Comparison is made between the succession here seen and that of other areas in Wales, Shropshire, the Lake District, and the South of Scotland, and the faunal features are noted and tabulated. An interesting feature comes to light: namely, the approximation of the Derfel-Limestone fauna to that of the Stinchar Limestone, rather than to that of any Welsh beds hitherto described.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 44. AUGUST 1921.

XIV.—*On Twelve new Species of* Curculionidæ *from South Africa.* By Guy A. K. Marshall, D.Sc., C.M.G.

The types of the new species described below are either contained in or will be presented to the British Museum.

Subfamily Otiorrhynchinæ.

Eremnus maculosus, sp. n.

♂. Integument black, thinly clothed with grey scaling above, which on the elytra forms numerous irregular denser spots; the lower surface more closely and evenly covered with similar scaling.

Head with close confluent punctation, forming longitudinal striolæ on the forehead and concentric rings on the vertex; the forehead somewhat flattened, broad, its width being about twice as great as the length of an eye, and with a deep median fovea. *Rostrum* very broad, hardly longer than its basal width, slightly narrowed for a short distance from the base and thence almost parallel-sided; the dorsal area broad and also nearly parallel-sided, almost flat, but slightly higher at the sides, with coarse confluent punctation and a median furrow, which is shallow at the base and deeper in front; the apical area shallowly impressed and with a low median carina, the epistome dull and coriaceous, its carina forming an obtuse angle. Antennæ with the scape reaching the apical constriction of the prothorax, rather slender, abruptly clavate, somewhat coarsely punctate, and closely set with short recumbent setæ; the two basal joints of the funicle equal, 3–6 slightly and progressively diminishing in length, 7 as long as 5, and all much longer than broad. *Prothorax* much broader than long, rather strongly rounded at the sides, broadest in front of the middle, with a broad apical constriction which is continued across the dorsum; the base distinctly marginate and a little broader than the apex, which is shallowly sinuate in the middle; the disk coarsely and confluently punctate, the shiny intervals bearing sparse fine punctures, and on each side a short low ridge lying between two shallow impressions; the scales very sparse, but more dense in the lateral impressions, in a very short longitudinal impression in the middle of the base, and in a small median spot near the apex. *Scutellum* invisible. *Elytra* ovate, jointly sinuate at the base, the apex (which is just visible directly from above) rather broadly rounded; the punctures in the striæ large and subquadrate; the intervals not broader than the striæ, subcostate, and each with a row of low granules which are much more prominent on the declivity on intervals 1, 3, 5, 7; the scales small and subquadrate, the recumbent setæ on the granules being hardly distinguishable from them. *Legs* uniformly and fairly densely clothed with pale scaling; the femora unarmed; the hind tibiæ flattened internally near the apex and there set with a number of erect brownish setæ, the corbel truncate almost transversely to the axis of the tibia, its inner edge bearing a broad vertical truncate lamina. *Sternum* with the intercoxal process of the mesosternum tuberculate. *Venter* with the last visible ventrite (♂) shallowly impressed across its whole width in the apical half, the basal area having a broad low rounded elevation on each side.

Length 8–9 mm., breadth 3·6–4 mm.

CAPE PROVINCE: 2 ♂♂.

Closely related to *E. atratus*, Sparrm., but this species has the prothorax much smoother and very finely punctate, with faint scattered punctures and the lateral impressions almost obsolete; the rostrum is sulcate only on the anterior half, and lacks the apical longitudinal carina; the forehead is much more finely punctate and not longitudinally striolate; the eyes are larger, the length being equal to nearly two-thirds the width of the forehead; the intervals on the elytra are almost bare and quite smooth on the disk, and interval

9 is strongly costate near the apex; the femora are rather thinly clothed with short recumbent setæ except for a band of scales near the apex, and on the lower surface they have a minute tooth and a row of small granules; the hind tibiæ (♂) are much more strongly flattened and for fully half the length from the apex, the lower edge being coarsely denticulate, the corbel obliquely truncate, and the lamina placed a little above the apical edge and lancet-shaped.

Eremnus cerealis, sp. n.

♀. Integument piceous, hidden by dense scaling; scales small and shiny, closely juxtaposed, but not overlapping. Scales on rostrum greyish white; head light brown above, greyish white beneath. Prothorax light brown above, with an inwardly ill-defined sinuous dark brown stripe on each side; beyond this an indefinite light brown patch in front of the middle, the rest of the lateral and lower surface being whitish. Elytra pale brown on the disk, with small alternating dark brown and whitish spots in the striæ; the lateral area beyond stria 7 entirely whitish. Lower surface whitish.

Head with shallow confluent punctation on the vertex and finely striolate on the forehead (this sculpturing quite hidden by the scaling), the frontal fovea linked up with the rostral furrow; the eyes nearly flat and rather coarsely facetted, further apart than usual, the distance between them being nearly double the length of one eye. *Rostrum* slightly longer than its basal width, narrowed from the base to the middle, and subparallel-sided from there to the apex; the dorsal area without sharply-defined lateral edges, very rapidly narrowed from the base to the antennæ, then widening again slightly, with a deep median furrow from the base to between the antennæ; the apical area with a very broad and deep semicircular impression, which contains no median carina, but bears strong separated punctures, each containing a minute scale, the interspaces being bare; the epistome with its posterior margin broadly truncate and forming a sharply raised ridge. *Antennæ* unusually short and stout; the scape gradually clavate, shortly exceeding the eye, with rather coarse punctures containing small scales and with short recumbent pale setæ; the funicle with joints 1 and 2 clavate and equal in length and breadth, 3–7 transverse and subequal. *Prothorax* much broader than long, strongly rounded at the sides, broadest at the middle, with a shallow apical constriction which is continued across the disk; the apex scarcely narrower than the base and its dorsal margin shallowly sinuate in the middle; the whole surface finely coriaceous, the sculpture being entirely hidden by the scaling; the setæ very sparse, short and recumbent on the disk, much longer and erect at the sides, and a fringe of short recumbent setæ along the basal margin. *Scutellum* small but distinct, bare. *Elytra* broadly oblong-ovate, obtusely rounded behind and subtruncate at the base; the dorsal outline gently convex, deepest far behind the middle, the posterior declivity distinctly incurved towards the actual apex; the striæ contain shallow punctures which are almost hidden by the scaling; the intervals almost flat towards the base and convex behind, much broader than the striæ and quite even, each with a single row of setæ which on intervals 1–7 are short and recumbent, and on the lateral ones longer and erect. *Legs* with separated pale scales and long erect setæ, even on the femora, which are not toothed; all the tibiæ broadly produced externally at the apex. *Sternum* and *venter* set with long obliquely raised setæ.

Length 5–6·25 mm., breadth 2·8–3·6 mm.

Cape Province: Malmesbury, 2 ♀ ♀; Rondebosch (*L. Peringuey*), 2 ♀ ♀.

Most nearly allied to *E. canaliculatus*, Boh., in its general form and sulcate rostrum, but the deep impression at the apex of the rostrum, the transverse distal joints of the funicle, the dilated tibiæ, and the erect setæ on the sides of the body and on the femora distinguish it from this and all other species of the genus known to me.

Dr. L. Peringuey, Director of the South African Museum, to whom I am indebted for the specimens, informs me that this species has done considerable damage to wheat and oats in the Cape Province during recent years.

Eremnus terrenus, sp. n.

♂ ♀. Integument black, the scaling either uniform brownish grey, or brown above irregularly and indefinitely variegated with grey.

Head with rather coarse confluent punctation, the ridges between the punctures for the most part visible through the scaling; the forehead flattened and with a central fovea; the short recumbent setæ with difficulty distinguishable from the scales. *Rostrum* much longer than broad, slightly narrowed from the base to the middle and thence strongly dilated to the apex; the dorsal area with fairly well-marked lateral edges, broadest in front and rapidly narrowing to the base, almost flat, and with an indistinct median carina; the apical area neither impressed nor carinate, but closely and finely punctate, the epistome very ill-defined. *Antennæ* with the scape gradually clavate, scarcely reaching the hind margin of the eye, rather coarsely punctate, and clothed with short recumbent pale setæ; the funicle with joint 1 as long as 2+3, joints 3–7 longer than broad and subequal. *Prothorax* nearly twice as broad as long, gently rounded at the sides, broadest about the middle, with a very shallow apical constriction; the apical margin only slightly narrower than the base and gently sinuate dorsally, postocular lobes well developed; the dorsum rugosely punctate, with low granules showing through the rather thin scaling and a much abbreviated indistinct median carina, and a very indistinct impression on each side behind the middle bounded externally by a faint costa; the setæ recumbent and only a little longer and narrower than the scales. *Scutellum* inconspicuous. *Elytra* broadly oblong-ovate in the ♀, much narrower and more ovate in the ♂, broadly rounded behind and gently sinuate at the base; the striæ with shallow punctures almost hidden by the scaling and each containing a minute scale; the intervals costate and each with a row of granules, which are much more prominent behind, each granule bearing a very short recumbent scale-like seta; the junction of intervals 7 and 9 at the base forming a small humeral callus. *Legs* fairly densely clothed with pale scales and short recumbent setæ, except on the lower edge of the tibiæ where the setæ are longer and suberect; anterior pairs of femora with a small tooth. *Venter* rugosely punctate but not granulate, the setæ all recumbent and scale-like.

Length 5·1–8 mm., breadth 2·4–4 mm.

Cape Province: Willowmore (*Dr. H. Brauns*), 3 ♂♂, 4 ♀♀.

Allied to *E. laticeps*, Boh., but in that species the antennæ are much longer and more slender; the dorsal area of the rostrum is parallel-sided for most of its length and triangularly impressed; the prothorax bears three pale stripes, with conspicuous rounded granules and very deep lateral impressions; the elytra have the suture elevated on the declivity in the ♀, and the intervals are not costate, the granules on them being more or less duplicated; and the venter is granulate and bears short curved setæ.

The genus *Eremnus*, as at present constituted, comprises a number of species of somewhat diversified structure and will doubtless be subdivided when subjected to an adequate revision. The species are restricted to South Africa, though

Faust has described a few insects under this name from Madagascar. Of these I have seen *E. rusticanus*, *E. longicornis*, *E. cristicollis*, and *E. humilis*, all of which differ from the Continental forms in the following particulars: the mentum bears two setæ on the disk; the metepisternal suture is complete; and the epistome is developed into a large even plate occupying the whole apex of the rostrum, not delimitated laterally, reaching the front margin of the scrobes and produced between them into an angular projection, which is separated from the rest of the rostrum by an incision. On the other hand, in true *Eremnus* the mentum is devoid of setæ on the disk; the metepisternal suture is incomplete; and the epistome is small, of normal form, and distant from the scrobes. For the Madagascar species the name *Neseremnus*, gen. nov., is proposed, with *E. rusticanus*, Fst., as the genotype.

The genotype of *Eremnus* has not hitherto been fixed, for Schönherr divided the genus into two sections and cited *E. exaratus*, Boh., as the type of the first and *E. setulosus*, Boh., as that of the second. *E. exaratus* is therefore now definitely selected as the genotype.

Subfamily *RHYTIRRHININÆ*.

Gronops postdentatus, sp. n.

♂ ♀. Integument black, covered with dense rough earth-brown scaling, the head, pronotum, and the posterior half of the dorsum of the elytra sometimes black.

Head with a very high broad ridge above each eye, being a continuation of the rostral ridge, and ending abruptly and perpendicularly at the posterior margin of the eye; the vertex flattened and the forehead between the ridges deeply depressed below the level of the rostrum; the whole covered with overlapping concave scales, and with a few short, thick, dark, recumbent setæ on the ridges. *Rostrum* with the dorsal outline evenly curved; the dorsal area elevated, paralled-sided, and with its lateral margins slightly and obtusely raised, the sides of the rostrum sloping and not vertical; the clothing as on the head. *Prothorax* a little longer than broad, almost parallel-sided from the base to beyond the middle, and then obtusely angulated; the apex rather narrower than the base, which is rounded; the dorsum with three broad, deep, longitudinal furrows, separated by two strong costæ which are very broad in their posterior two-thirds and much narrower in front, each furrow being interrupted in the middle by a low transverse ridge; the clothing like that on the head. *Scutellum* small, densely covered with pale overlapping scales. *Elytra* oblong, the shoulders obtusely prominent and with a similar rounded projection below and behind them, the apices separately pointed; interval 1 not elevated, rather narrow, but wider at the top of the declivity, and there bearing a common bifid tubercle projecting horizontally backwards; the first two striæ geminate, the punctures quadrate and sometimes transversely confluent; interval 3 forming a narrow undulating carina, with a broad, inwardly hooked callus at the base, and two elevations at the middle, that at the top of the declivity being the larger and forming a sharp backwardly-pointed tubercle; on the declivity this interval is not carinate, but at its apical junction with interval 9 there is a prominent conical tubercle; between the basal callus on interval 3 and the humeral prominence is a broad basal excavation; striæ 3 and 4 geminate and rather irregular; interval 5 with an elevation just behind the basal excavation, another about the middle, one or two granules behind the middle, and with a large conical tubercle (the largest of all) on the declivity; interval 7 forming a low undulating or denticulate carina; the lateral intervals plane; some of the dorsal elevations form two oblique tuberculate ridges, one running from the posthumeral elevation to behind the middle on interval 3, and the other (less distinct) nearer the base; the scales concave and densely overlapping; the setæ stout, short, and recumbent, being much more numerous on the elevated areas.

Length 3·6–5 mm., breadth 1·6–2·1 mm.

Cape Province: Willowmore (*Dr. H. Brauns*—type); Kimberley, ix. 1905 (*G. A. K. M.*). Orange Free State: Bothaville (*Dr. Brauns*).

Described from forty-three specimens.

Gronops braunsi, sp. n.

♂ ♀. Integument black, densely covered throughout with unicolorous overlapping earth-brown scaling.

Very similar to, though smaller than, the preceding species, and differing in the following particulars:—

Head with the scales on the vertex flat and not concave; the supraocular ridges not vertically truncate behind, but sloping. *Rostrum* markedly broader in proportion to its length. *Prothorax* broadest in front of the middle, and its sides there strongly rounded, but not angularly dilated; the six impressions similar but shallower; the recumbent setæ about twice as long. *Elytra* more regularly oblong, the shoulders well marked but without any humeral prominence, no projection on interval 9 behind the shoulder, and the apices jointly rounded; the alternate intervals slightly and more or less evenly costate, without tubercles behind, except for a low prominence at the apex of interval 5; the scales much larger and flat, the setæ nearly twice as long, being much more numerous on the raised intervals than on the others.

Length 3·2–4·4 mm., breadth 1·4–2 mm.

Cape Province: Willowmore (*Dr. H. Brauns*).

Described from 113 specimens.

Gronops oneili, sp. n.

♂ ♀. Integument black, with dense sandy or earth-brown scaling, with a broad darker transverse band behind the middle; the posterior pairs of femora and tibiæ each with two dark brown patches; the apical area of the rostrum with small convex greenish-white scales.

Head with the scales flat and contiguous, not overlapping; the supraocular ridges comparatively low, sloping behind, and hardly reaching the hind margin of the eye. *Rostrum* parallel-sided from the base to the antennæ, the apical area being slightly wider; the dorsal outline distinctly angulated at the insertion of the antennæ; the posterior angle of the lower edge of the scrobe produced backwards into a blunt projection; the dorsum rounded at the sides, with a narrow shallow median furrow and two indistinct striæ on either side, each containing a row of recumbent setæ, and there is an additional dorsal row on each side; when abraded the surface is very rugosely punctate. *Prothorax* with the sides strongly rounded in front, broadest much before the middle, and gradually narrowed from there to the base, the sides being almost straight in the basal half; the dorsum with a broad median furrow and two deep impressions on each side of it; the raised areas with very deep scattered punctures, each containing a short seta, the setæ being much finer than those on the rostrum or elytra; the scales small, not impressed, and hardly overlapping. *Scutellum* small, but prominent. *Elytra* differing from those of the two preceding species in being relatively broader, slightly rounded at the sides, and gently convex longitudinally; the shoulders with a rounded humeral prominence, but none on interval 9, the apices jointly rounded; the punctures in the striæ small but deep, quite regular, and not geminate; the suture and the alternate intervals more raised, interval 3 more strongly costate than the others behind the middle and with a callus at its base, and interval 5 ending in a small sharp tubercle on the declivity; the scales flat and only slightly overlapping, the raised intervals alone having a row of large, scale-like, recumbent setæ. *Sternum* entirely lacking the prosternal impression.

Length 2·6–3·2 mm., breadth 1·4–1·6 mm.

Cape Province: Uitenhage, ix. 1899 (*Father J. A. O'Neil*); Willowmore (*Dr. H. Brauns*).

Described from three specimens.

Readily distinguished from the other two species by its small size and more convex form, the characteristic scaling at the apex of the rostrum, the form of the scrobe, and by the absence of the prosternal furrow. In his key to the *Rhytirrhinides* Lacordaire erroneously separates *Gronops* from *Hypocolobus* and *Borborocœtes* on the ground that joint 7 of the funicle is annexed to the club in the latter, but not in the former, although in his description of *Gronops* he correctly states that this joint is contiguous to the club. For this character should be substituted one drawn from the epistome, which is sharply defined and bounded behind by a high carina in *Hypocolobus* and *Borborocœtes* (sometimes modified into a short horn in the former genus), whereas in *Gronops* and its allies there is no trace of a carina and the epistome is quite undefined. The three species described above are the only true *Gronops* known to me from South Africa.

Genus Notogronops, nov.

Schönherr (Gen. Curc. vi. 2, p. 135) divided *Gronops* into two sections: the first, which includes the genotype, *G. lunatus*, F., is characterised by its oblong elytra and angulate shoulders, while in the second the elytra are ovate and without any humeral callus. In the second group he placed three South-African species—*proletarius*, Boh., *punctirostris*, Boh., and *squalidus*, Boh. I am acquainted with the first and third of these (the type of the second is lost, but the description suggests that it was perhaps only an abraded specimen of *proletarius*), and it is clear that they cannot satisfactorily be retained in *Gronops*; for, apart from the difference in the form of the elytra and the absence of the shoulders, they differ in having joint 7 of the funicle quite distinct from the club, and the metasternum between the mid and hind coxæ is shorter than the mid-coxa, whereas in *Gronops* it is much longer.

Genotype, *Gronops proletarius*, Boh.

Notogronops estriatus, sp. n.

♂. Integument black, with dense scaling; the whole upper surface dull smoky black; the lower surface grey, with a large oblong blackish-brown patch occupying the middle of the metasternum and of the first two ventrites.

Head convex, with a very shallow transverse impression before the base of the rostrum; the scales flat, not overlapping, with sparse, short, stout, recumbent setæ. *Rostrum* almost straight, a little shorter than the median length of the pronotum (8 : 9), very slightly narrowed from the base to the antennæ and then abruptly widened; the dorsum transversely convex, without sulci or carinæ, the basal half clothed like the head, the interantennal area without scales, but with dense curled setæ; the genæ with dark scaling and long, stiff, black setæ. *Antennæ* red-brown; joint 2 of the funicle nearly as long as the next two together. *Prothorax* a little longer than the basal width (9 : 8), slightly widening from base to apex, the sides almost straight, the postocular lobes very prominent; the dorsum convex in both directions, highest near the base and sloping strongly in front, with a deep median furrow from the base nearly to the apex, but no lateral impressions; the strong reticulate punctures normally hidden by the dense scaling, and with sparse, stout, recumbent setæ. *Elytra* narrowly ovate, broadest at about one-fourth from the base, the basal margin deeply sinuate, the apices jointly rounded, without any striæ or rows of punctures even when the scaling is removed, but the first and alternate intervals represented by rows of stout recumbent setæ, which are dark and larger on the disk and pale and smaller at the sides; intervals 3 and 5 shortly costate at the base. *Legs* densely clothed with pale scaling, the femora with a dark patch in the middle and another near the apex, the tibiæ with one at the base and one at the middle; the femora with dense pale setæ beneath.

Length 4 mm., breadth 1·6 mm.

Cape Province: Algoa Bay, 26. vii. 1896 (*Dr. H. Brauns*).

Described from a single specimen.

Easily distinguished from the other described species of the genus by its unusual colouring and by the absence of the lateral impressions on the prothorax and of the punctures on the elytra.

Subfamily *CLEONINÆ.*

Genus MICROLARINUS, Hochh.

This genus has not previously been recorded from the Ethiopian region, though a South-African species was described long ago by Gyllenhal under the name of *Larinus pilosus.* The three species known to me are all natives of the dry south-western districts of South Africa, and they may be discriminated by the following characters :—

Rostrum narrower at the apex than at the base; the dorsal outline of the elytra not higher at the middle than at the base.
  Elytra evidently broader than the prothorax, which is slightly broader than long (11 : 12); the longest setæ on the elytra much longer than the scape, the alternate intervals bearing longer setæ than the others .... *pilosus*, Gyl.
  Elytra not or but slightly broader than the prothorax, which is longer than broad (6 : 5); the longest setæ on the elytra shorter than the scape, those in the alternate rows not longer than the others .... *angustulus*, sp. n.
Rostrum not narrower at the apex than at the base; the dorsal outline of the elytra higher at the middle than at the base .... *brevirostris*, sp. n.

Microlarinus brevirostris, sp. n.

Colour black, thinly clothed with short recumbent grey hairs, which form a denser (and therefore paler) lateral stripe on the prothorax and elytra, a similar short stripe at the apex of interval 3, a short oblique line behind the middle between striæ 5 and 8, and a spot at the base of interval 2.

Head with very coarse, longitudinally confluent punctures, the forehead not flattened, slightly convex, and not transversely impressed. *Rostrum* stout, a little shorter than its basal width, parallel-sided, and sculptured like the forehead. *Prothorax* broader than long (9 : 10), broadest at the base, and very gradually narrowed at the apex, the sides almost straight; the upper surface with very coarse punctures and set with moderately long, erect, white setæ. *Elytra* subelliptical, distinctly broader than the prothorax, but the shoulders very sloping and the sides very slightly rounded; the dorsal outline more or less convex, lower at the base than in the middle, owing to a shallow depression round the scutellum; the intervals flat, finely rugose, the first slightly higher than the others and bearing, with the alternate intervals, a row of long erect white setæ, which are not longer than the scape, the setæ on the remaining intervals being not more than half the length.

Length 3½–4 mm., breadth 1¼–1⅜ mm.

Cape Province: Uitenhage (*Father J. A. O'Neil*).

Described from ten specimens.

Microlarinus angustulus, sp. n.

Colour piceous, with comparatively thin recumbent grey hairs and more or less ochreous-brown powdering; the prothorax with a broad lateral stripe of very dense whitish hairs, which is abruptly and broadly produced inwards on the anterior half, so that the dark discal area, on which the hairs are darker and much shorter, is nearly half as wide in front as it is at the base; the elytra with rather thin grey hairs, a whitish spot at the shoulder and at the base of interval 3, and some small ill-defined pale spots laterally on the posterior half formed of denser groups of hairs.

Head with longitudinally confluent punctation and rather densely setose, the forehead transversely flattened and with a shallow median fovea. *Rostrum* as long as its basal width, sharply narrowed from the base to the middle, and thence parallel-sided, much more finely punctate than the forehead and with a median furrow in the basal half only. *Prothorax* subcylindrical, a little longer than broad, feebly rounded at the sides, broadest at the middle, the apex only slightly narrower than the base, with coarse reticulate punctures and short suberect pale setæ. *Elytra* cylindrical, not much broader than the prothorax, the shoulders oblique, the dorsal outline almost continuous with that of the prothorax and quite flat for more than two-thirds the length; the very shallow striæ with closely-set quadrate punctures, the intervals as broad as or narrower than the striæ, flat, and each bearing a row of rather short, obliquely raised setæ of approximately equal lengths; a low elevation at the base on each side of the suture.

Length 3·2–4 mm., breadth 1–1·2 mm.

Cape Province: Willowmore (*Dr. H. Brauns*—type). Damaraland: Svakop River (*J. Wahlberg*—Stockholm Mus.).

Described from two specimens.

Much narrower and more cylindrical than any of the other described species.

Subfamily *ERIRRHININÆ.*

Hyposomus longipilis, sp. n.

Integument piceous, clothed with dense grey scaling above and below; the pronotum with the disk brownish, except for a complete, narrow, pale median stripe; the elytra with a large darker discal patch of the same shape as the elytra themselves, outlined with dark brown and extending as far as stria 4 and terminating in a point at the top of the declivity.

Head with close confluent punctation which is entirely concealed by the closely-packed concave scales, which are much smaller than those on the rostrum, and set with short erect spatulate scales. *Rostrum* about as long as the pronotum, slightly narrowed from the base to the middle and thence parallel-sided, with the dorsal outline only slightly curved but sloping rather abruptly near the apex; the dorsal punctation close and confluent, but hidden by the scales, which are not overlapping or concave; a lateral row of punctures on each side, which are partly visible through the scaling, each bearing a short erect seta, and two similar but more widely-spaced rows of setæ on the dorsum; the sides of the rostrum below the scrobe partly clothed with scales. *Antennæ* testaceous, with very fine testaceous setæ; joint 1 of the funicle about as long as the next two together. *Prothorax* broader than long, moderately rounded at the sides, shallowly constricted near the apex, the constriction faintly continued across the disk; the dorsal apical margin truncate and much narrower than the base, which is broadly rounded; the dorsum with fine reticulate punctation throughout, the concave scales covering and fitting into the punctures. *Elytra* comparatively rather broadly ovate, very slightly rounded at the sides, acuminate behind, with the apices jointly rounded; the basal margin deeply and jointly sinuate and not elevated, the external angles rounded and not very prominent; the striæ shallow, with the punctures covered by, but perceptible through, the scaling, each containing a very minute seta; the intervals much broader than the striæ, slightly convex, covered with flat scallop-like overlapping scales, the alternate ones with a row of setæ which on the basal two-thirds are short, curved, and nearly recumbent, but on the apical third long, straight, and erect. *Legs* stout, densely clothed with overlapping concave scales and short erect setæ; the anterior tibiæ with an obtuse angulation at the middle of the inner edge; the fourth tarsal joint twice as long as the third. *Sternum* with a broad shallow longitudinal impression in front of the fore coxæ. *Venter* with the suture between ventrites 3 and 4 (1st and 2nd visible) broadly fused in the middle.

Length 4–4·5 mm., breadth 1·8–2 mm.

Cape Province: Table Mountain (*W. Bevins*).

Described from four specimens.

Hypsomus bevinsi, sp. n.

Extremely like a very small *H. longipilis*, but differing as follows:—The prosternum not impressed in front of the coxæ; the suture between ventrites 3 and 4 (the 1st and 2nd visible) distinct throughout and deeply sinuate in the middle; the apical constriction of the prothorax is not continued across the disk; the setæ at the apex of the elytra are much shorter and fewer, and there is a broad brown lateral stripe on the prothorax and on the inflexed margin of the elytra.

Length 2·5–3 mm., breadth 1–1·25 mm.

Cape Province: Table Mountain (*W. Bevins*); Camps Bay, viii. 1905 (*G. A. K. M.*)

Described from twelve specimens.

Hypsomus albosuturalis, sp. n.

Integument red-brown, the pronotum darker; the head and rostrum with grey scaling turning to whitish round the eyes; the prothorax brown on the disk, with a median whitish stripe and two lateral ones on each side; the elytra with a broad white sutural stripe ceasing at a little distance before the apex, brown between striæ 1 and 4, dark grey between striæ 4 and 8, and whitish between 8 and the lateral margin; the lower surface densely clothed with whitish scaling.

Head with fine confluent punctation, which is entirely hidden by flat, contiguous, and not overlapping scales. *Rostrum* comparatively long and slender, as long as the head and pronotum together, much narrower than the forehead at the base, subcylindrical throughout, and moderately curved; a deep lateral punctate stria extending from the base to the antennæ, and two deep dorsal impunctate striæ from the antennæ to the apex; the scales flat and contiguous, and confined to the dorsum between the lateral striæ and not extending beyond the antennæ; the lateral striæ each containing a row of short erect setæ, but no dorsal ones. *Antennæ* testaceous, with fine testaceous setæ; the funicle with joint 1 as long as the next three together. *Prothorax* a little broader than long, rounded at the sides, broadest at the middle, shallowly constricted at the apex, which is not much narrower than the base, the latter being truncate in the middle, with the lateral angles entirely rounded off; the dorsum throughout with close reticulate punctures, which are quite distinct on the dark areas but hidden by the white scaling. *Elytra* narrow, subelliptical, acuminate behind, with the apices jointly rounded, the basal margin broadly sinuate and not elevated, and the lateral angles obtusely prominent; the very shallow striæ with rather strong, clearly visible punctures, each containing a very minute seta; the intervals flat, broader than the striæ, without any apparent setæ on the disk, but intervals 5, 7, and 9 each with a sparse row of minute bent setæ; the apex, however, bears rather dense, short, erect setæ; the scales flat and only slightly overlapping, not well-defined on the darker parts. *Legs* with dense, slightly concave, pale scales and short erect setæ; the front tibiæ not angulate internally; the tarsi broader than usual, the 4th joint only half as long again as the 3rd. *Sternum* not impressed in front of the fore coxæ. *Venter* with the suture between ventrites 3 and 4 (nominally 1 and 2) distinct throughout and gently sinuate in the middle.

Length 2–3·5 mm., breadth 0·75–1·25 mm.

CAPE PROVINCE: Table Mountain (*W. Bevins*).

Described from eight specimens.

Only three other species of *Hypsomus* have been previously described, and the salient characters are given in the following table:—

1 (2). Elytra subtruncate at the base, the basal angles not produced forwards, a distinct humeral angle present; base of rostrum raised above level of forehead; a distinct small scutellum . . . . *parvus*, Mshl.*

2 (1). Elytra deeply sinuate at the base, the basal angles strongly produced forwards,

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* Proc. Zool. Soc. Lond. 1906, p. 935, pl. lxvi. fig. 11 (1907).

no trace of a humeral angle; rostrum continuous with the forehead; scutellum invisible.

3 (6). Elytra with the alternate intervals higher at the base and the margin itself elevated, the apices separately mucronate; the scaling of the elytra fused so as to form an apparently calcareous indumentum in which the individual scales are not distinguishable; the setæ minute.

4 (5). Prothorax subcylindrical, about as long as broad; interval 9 on the elytra not carinate at the base; rostrum with dense confluent punctation at the sides, which is entirely hidden by scaling .... *lembunculus*, Boh.

5 (4). Prothorax transverse, with sides rounded, and much narrower at the apex than at the base; interval 9 on the elytra strongly carinate near the base; rostrum bare at the sides and there impunctate, except for two shallow punctate striæ .... *scapha*, Boh.

6 (3). Elytra with neither the base nor the alternate intervals elevated, the apices jointly rounded; the scales on the elytra distinct and overlapping, the setæ well-developed and erect on the apical half.

7 (10). Rostrum much deeper than wide, as broad at the base as the forehead, without dorsal furrows in front of the antennæ, and with the sides below the scrobes partly squamose; 4th tarsal joint at least twice as long as 3rd; elytra without a white sutural stripe.

8 (9). Prosternum with a broad longitudinal impression in front of the coxæ; the suture between ventrites 3 and 4 (1st and 2nd visible) entirely obliterated in the middle; length (without rostrum) 4–4·5 mm.; elytra with very long erect setæ on the apical third .... *longipilis*, sp. n.

9 (8). Prosternum not impressed; the suture between ventrites 3 and 4 distinct throughout and strongly sinuate in the middle; length 2·5–3 mm.; elytra with fewer and much shorter setæ on the declivity only.. *bevinsi*, sp. n.

10 (7). Rostrum subcylindrical, much narrower at the base than the forehead, with two dorsal furrows from the antennæ to the apex, and with the sides below the scrobes entirely bare; 4th tarsal joint half as long again as 3rd; elytra with a white sutural stripe .... *albosuturalis*, sp. n.

XV.—*New or little-known* Tipulidæ (*Diptera*).—V. *Ethiopian Species*. By CHARLES P. ALEXANDER, Ph.D., Urbana, Illinois, U.S.A.

THE present paper is a continuation of the preceding parts under this title. The holotypes are preserved in the writer's collection, except where noted to the contrary.

Dicranomyia (*Thrypticomyia*) *nigeriensis*, sp. n.

General coloration brown, the mesonotum reddish brown; pleura testaceous; legs with the metatarsi entirely white; wings pale brownish subhyaline; stigma elongate, dark brown; Sc_1 ending opposite the origin of *Rs*.

Male.—Length 6 mm.; wing 7–7·2 mm.

Female.—Length 6 mm.; wing 6·8 mm.

Rostrum pale brown; palpi dark brown. Antennæ dark brown. Head dark brown, grey pruinose.

Mesonotum reddish brown. Pleura testaceous. Halteres very elongate, dark brown. Legs with the coxæ and trochanters testaceous; femora dark brown, paler basally; tibiæ dark brown; tarsi pure white, the terminal segments scarcely darkened. Wings pale brownish subhyaline; stigma elongate, dark brown; veins dark brown. Venation: Sc_1 ending opposite the origin of *Rs*, Sc_2 a short distance from the tip, Sc_1 about equal to the basal deflection of Cu_1; penultimate section of R_1 from one and one-half to twice *r*; basal deflection of R_{4+5} strongly arcuated; in some specimens the inner end of cell *1st* M_2 is strongly arcuated, less so in other specimens; basal deflection of Cu_1 beyond mid-length of cell *1st* M_2.

Abdomen dark brown.

Hab. Nigeria.

Holotype, ♂, Effon Forest, November 10, 1920 (*A. W. J. Pomeroy*).

Allotopotype, ♀.

Paratopotypes, 2 ♂'s.

Holotype in the collection of the British Museum (Natural History).

Dicranomyia nigeriensis is related to *D. seychellensis* (Edwards), from which it differs in the uniformly white tarsi, the elongate halteres, and the details of the wing-venation. The known species of the subgenus *Thrypticomyia* occur in the Ethiopian Region (2), Palæarctic Region, Japan (1), Oriental Region (2), and the Australian Region (4).

Dicranomyia venustula, sp. n.

General coloration light yellow; antennæ yellow, the first scapal segment dark brown; legs yellow, the tips of the femora and tibiæ narrowly infuscated; wings light yellow, spotted with brown; *Sc* short, *Rs* square at origin.

Male.—Length 4·4–5 mm.; wing 4·6–5 mm.

Female.—Length 5·5 mm.; wing 6 mm.

Rostrum and palpi dark brown. Antennæ light yellow, the first scapal segment dark brown; in the male, the flagellar segments are short-petiolate basally and are provided with long verticils. Head dark brown, indistinctly pruinose.

Mesonotum and pleura pale whitish yellow, unmarked. Halteres yellow. Legs yellow, the tips of the femora narrowly dark brown, of the tibiæ still more narrowly dark brown; terminal tarsal segments infuscated. Wings with a faint yellowish tinge, sparsely variegated with brown spots, arranged as follows: At tip of *Sc* and origin of *Rs*; at stigma; seams along the cord and outer end of cell *1st* M_2; spots at the ends of veins R_{2+3}, M_{1+2}, M_3, Cu_1, Cu_2, and the anal veins, the two latter the largest; veins yellow, brown in the infuscated areas. Venation: *Sc* short, Sc_1 ending immediately beyond the origin of *Rs*, Sc_2 at tip; *Rs* square at origin or with the angle of curvature proximad of the actual origin, sometimes spurred; inner ends of cells R_3 and *1st* M_2 lying far proximad of cell R_5; cell *1st* M_2 closed, shorter than vein M_{1+2} beyond it but longer than M_3; basal deflection of Cu_1 at or immediately before the fork of *M*; Cu_2 shorter than the basal deflection of Cu_1.

Abdomen yellow, the apices of tergites narrowly infuscated, broadest medially. Male hypopygium with the pleural appendage elongate and slender, cylindrical, directed proximad and decussate with its mate across the genital chamber. Ovipositor with the sternal valves blackened at base.

Hab. Cameroun.

Holotype, ♂, Elat, 1920 (*J. A. Reis*).

Allotopotype, ♀.

Paratopotypes, 3 ♂'s.

D. venustula is most closely related to the larger *D. woosnami*, Alexander (East Africa).

Dicranomyia pauciguttata, sp. n.

Related to *D. guttula*, Alexander (Portuguese East Africa) general coloration yellowish brown; thoracic pleura with a broad dark brown longitudinal stripe; wings grey with a sparse brown dotting along the veins; *Sc* short; cell *1st* M_2 irregular in shape, lying far out in the wing-membrane.

Male.—Length 4·8 mm.; wing 5·5 mm.

Female.—Length 5 mm.; wing 6 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown; basal flagellar segments subglobular, gradually passing into oval. Head greyish pruinose.

Mesonotum yellowish brown, covered with a yellow pollen; four indistinct longitudinal brown stripes, the intermediate pair indicated only in front. Pleura testaceous with a broad and conspicuous but ill-delimited fuscous longitudinal stripe extending from the cervical sclerites to the base of the abdomen. Halteres yellow, the knobs pale brown. Legs with the coxæ brown; trochanters brownish testaceous; femora yellowish brown, the extreme tips indistinctly paler; remainder of the legs brown, on the tarsi passing into darker brown. Wings grey with a sparse brown pattern that is confined to the veins, the principal spots as follows: at tip of *Sc* and origin of *Rs*; fork of *Rs*; tip of R_1; along cord; at tips of longitudinal veins; one before mid-length of *M* and another less distinct spot before the end of *M*; a series of about three small spots along *Cu*; an indistinct series in cell *C*; two spots along vein *2nd A*; wing-axil darkened; veins pale, darker in the infuscated areas. Venation: *Sc* short, Sc_1 extending a short distance beyond the origin of *Rs*; *Rs* about equal to the deflection of R_{4+5} and approximately in alignment with it, both gently arcuated; cell *1st* M_2 very irregular, situated far out in the membrane; inner end greatly arcuated, about as long as the basal deflection of Cu_1; *m* short, from one-third to one-quarter the length of the outer deflection of M_3; basal deflection of Cu_1 at or some distance before the fork of *M*.

Abdomen brown. Male hypopygium with the ventral pleural appendage relatively small but fleshy; dorsal pleural appendage a powerful chitinized black hook, the tip acute.

Hab. Cameroun.

Holotype, ♂, Batanga, June 12, 1920 (*J. A. Reis*).

Allotopotype, ♀, August 12, 1920.

Dicranomyia mendica, sp. n.

Antennæ dark brown; head grey pruinose, the vertex with a median dark line; mesonotum yellowish brown, præscutum with three brown stripes; femora dark brown, the tips conspicuously yellow; wings greyish subhyaline; stigma brown; *Sc* long, cell 1*st* M_2 closed; abdominal segments dark brown, the caudal margins of the segments broadly pale.

Male.—Length 5·5 mm.; wing 6·6 mm.

Female.—Length 6 mm.; wing 7 mm.

Rostrum slightly produced, brown; palpi dark brown. Antennæ dark brown, the elongate terminal segment paler brown; flagellar segments elongate-oval. Head light grey, the vertex with a dark, elongate, median stripe.

Pronotum yellowish testaceous, dark brown medially. Mesonotal præscutum with three conspicuous dark brown stripes, the median stripe longest and broadest; lateral stripes indistinctly delimited at their anterior ends; pale interspaces narrow; lateral margins of præscutum sparsely pruinose; scutum testaceous, the lobes dark brown; scutellum and postnotum sparsely pruinose. Pleura testaceous; a brownish area on mesepisternum. Halteres yellow, the knobs dark brown. Legs with the coxæ and trochanters concolorous with the pleura; femora testaceous basally, passing into dark brown before the tips; apices conspicuous pale yellow; remainder of the legs dark brown. Wings greyish subhyaline, the costal and subcostal cells slightly more saturated; stigma oval, brown; veins dark brown. Venation: *Sc* long, Sc_1 extending to about opposite four-fifths *Rs*; Sc_2 at tip of Sc_1; *Rs* long, gently arcuated; *r* at tip of R_1; basal deflection of R_{4+5} about equal to or a little longer than the deflection of M_{1+2}; cell 1*st* M_2 about as long as the outer section of Cu_1; basal deflection of Cu_1 at, or immediately before, the fork of *M*, longer than Cu_2.

Abdominal segments dark brown, the posterior margins of the segments broadly pale.

Hab. Cameroun.

Holotype, ♂, Bidu, July 24, 1920 (*J. A. Reis*).

Allotopotype, ♀.

Paratopotype, ♀.

Dicranomyia submendica, sp. n.

General coloration brownish yellow, the thoracic pleura with a conspicuous dark brown longitudinal stripe; wings uniformly pale brown, stigma small, subcircular; *Sc* long, cell 1*st* M_2 closed; abdominal tergites dark brown, sternites obscure yellow, the caudal margins of the segments dark brown; pleural appendage of male hypopygium subequally bifid.

Male.—Length about 5 mm.; wing 5·3 mm.

Female.—Length 5·7 mm.; wing 5·5 mm.

Rostrum and palpi dark brown. Antennæ dark brown, the oval flagellar segments densely white pubescent. Head grey.

Mesonotal præscutum obscure brownish yellow with three ill-defined darker brown stripes, the lateral stripes paler anteriorly, behind crossing the suture and suffusing the scutal lobes. Pleura testaceous yellow with a conspicuous dark brown dorsal longitudinal stripe. Halteres dark brown, the base of the stem conspicuously light yellow. Legs with the coxæ and trochanters testaceous yellow; remainder of the legs dark brown, the femoral bases slightly paler. Wings with a uniformly pale brown tinge; stigma small, subcircular in outline, dark brown; veins dark brown. Venation: *Sc* long, Sc_1 ending immediately before mid-length of *Rs*, Sc_2 at tip of Sc_1; *Rs* long, feebly angulated at origin; cell 1*st* M_2 closed; basal deflection of Cu_1 at or beyond the fork of *M*.

Abdominal tergites dark brown, the ninth tergite obscure yellow; sternites obscure yellow, the caudal margins dark brown. Male hypopygium with the single fleshy pleural appendage profoundly bifid into two subequal, digitiform, hairy lobes. Ovipositor with the bases of the powerful sternal valves blackened.

Hab. Cameroun.

Holotype, ♂, Lolodorf, November 16, 1920 (*J. A. Reis*).

Allotopotype, ♀.

Dicranomyia submendica is undoubtedly related to *D. fuscopleura*, but is readily distinguished by the larger size and structure of the male hypopygium.

Trentepohlia (*Mongoma*) *dummeri*, sp. n.

Similar to *T. fragillima*; white femoral tips narrow; white tibial tips occupying a little less than one-third the length of the segment; wings grey, the tips darkened; abdominal sternites obscure yellow.

Male.—Length 10–11 mm.; wing 9–10·2 mm.

Female.—Length about 10 mm.; wing 9·2 mm.

Rostrum yellow, brown in some specimens; palpi dark brown. Antennæ with the first scapal segment yellow, the remainder dark brown. Front and anterior part of vertex obscure yellow; remainder of head dark brown.

Mesonotum brown, the pleura obscure yellowish testaceous. Halteres dark brown. Legs with the coxæ and trochanters yellowish testaceous; femora dark brown, the tips rather narrowly (1·1 mm.) white; tibiæ dark brown, the bases narrowly (1·4 mm.) white, the tips rather broadly (5–5·2 mm.) white; the broad brown tibial band is about twice the pale tip; tarsi white; fore femora with two delicate bristles a short distance beyond the base. Wings grey; stigma dark brown; cell *Sc* and wing-tip darkened; indistinct seams along cord and vein *Cu*; veins dark brown. Venation: *r* on R_{2+3} before the fork, a distance less than *m*.

Abdominal tergites dark brown; sternites obscure yellow.

Hab. Uganda.

Holotype, ♂, Mabira Forest, Kyagwe Country, altitude 4000 feet, August 12, 1920 (*R. A. Dummer*).

Allotopotype, ♀, August 10, 1920.

Paratopotypes, 2 ♂'s, August 9, 1920.

"Along a stream in forest."

There can be no doubt but that many African species of *Trentepohlia* answer the brief characterization of *T. fragillima* (Westwood). Mr. Edwards informs me that the type of the latter is not now in the Hope Collections in the Oxford Museum and may no longer be in existence. The present species differs from *T. fragillima* in the conspicuously larger size and the coloration of the abdominal and thoracic sternites. The degree of whitening of the tibial tips in *T. fragillima* is not known. I take pleasure in naming this fly after the collector, Mr. R. A. Dummer.

Trentepohlia (*Trentepohlia*) *nigricolor*, sp. n.

General coloration shiny black; halteres yellow; posterior coxæ testaceous yellow; a single strong bristle on posterior tibiæ before tips; wings whitish subhyaline, cross-banded with brown, the centre of cell R_2 pale; abdomen black, the genital segment obscure reddish.

Male.—Length 6·3 mm.; wing 5·6 mm.

Female.—Length about 6·5 mm.; wing 5·7 mm.

Rostrum, maxillary and labial palpi dark brown. Antennæ dark brown throughout; flagellar segments cylindrical. Head dark grey; eyes of male large, the vertex between them very narrow.

Thorax shiny black, the humeral region not brightened. Halteres light yellow. Legs with the coxæ brownish testaceous, the fore coxæ darkest, the posterior coxæ testaceous yellow; trochanters obscure yellowish brown; remainder of the legs brown, the tarsi very slightly paler; a long curved bristle before tip of hind tibia in both sexes; in the males, at least, a similar bristle may occur on the tibiæ of other legs. Wings whitish subhyaline; cells *C* and *Sc* more yellowish; conspicuous dark brown bands on the wing; a basal area occupying the bases of cells *R* to *1st A*; a band at the cord, broadened out in the base of cell *1st* R_1, the centre of this area varying from pale to almost solid, the mark extended along the cord and vein *Cu* as broad conspicuous seams; distal band occupying the wing-tip, but centre of cell R_2 distinctly pale; veins brown, more yellowish in the pale costal areas. Venation: *Rs* in alignment with the deflection of R_{4+5}; R_{2+3} strongly arcuated, tip of R_1 and *r* very pale, subatrophied; cell R_3 spoon-shaped, greatly dilated on its proximal half, the outer half narrow and with parallel sides; basal deflection of Cu_1 immediately before the fork of *M*; fusion of Cu_2 and *1st A* slight.

Abdomen black, the genital segment in both sexes obscure reddish.

Hab. Cameroun.

Holotype, ♂, Efulan, June 5, 1920 (*J. A. Reis*).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀.

Trentepohlia (*Trentepohlia*) *nox*, sp. n.

General coloration black; knob of halteres brown; legs brownish yellow, the tips of the femora conspicuously brownish black; posterior tibiæ with three or four bristles before tips; wings pale greyish subhyaline; veins conspicuously seamed with brown; centre of the large cell *1st* R_1 pale; wing-tip darkened, this including all of cell R_2; *Rs* about one-half longer than the first section of R_{2+3}.

Female.—Length 7 mm.; wing 6·9–7 mm.

Mouth-parts yellow; palpi dark brown. Antennæ dark brown. Head dark brown.

Mesonotum shiny brownish black, the extreme anterior margin of præscutum on either side of median area obscure yellow. Pleura shiny dark brown. Halteres dark brown, the base of the stem pale. Legs with the coxæ and trochanters obscure yellow; femora brownish yellow, the tips rather narrowly but conspicuously dark brownish black; tibiæ pale brownish yellow, the extreme base indistinctly darkened; tarsi concolorous; posterior tibiæ with three or four rather powerful black bristles just before the tip. Wings pale greyish subhyaline; wing-veins and apex suffused with brown; cells *C*, *Sc*, and most of *2nd* R_1 more greyish yellow; the brown seams are most conspicuous along *Rs*, the cord, *Cu* and its branches, and all the veins beyond the cord with the exception of the distal section of R_{2+3}; the darkened wing-tip includes all of cell R_2, the ends of *2nd* R_1 and *2nd* M_2, the distal three-fifths of R_3, and the distal half of R_5; stigma oval, darker brown; veins dark brown. Venation: *Rs* long, gently arcuated at origin, about one-half longer than the first section of R_{2+3}; first section of R_{2+3} a little longer than the second section; petiole of cell R_5 short, about equal to the basal deflection of R_{4+5}; fusion of C_1 and *1st A* punctiform.

Abdominal tergites black; sternites conspicuously bicolorous, the basal three-fifths of the intermediate segments yellow, the caudal margins conspicuously blackened; a black subterminal ring; ovipositor bright chestnut horn-colour.

Hab. Cameroun.

Holotype, ♀, Lolodorf, January 15, 1919 (*J. A. Reis*).

At first sight, *Trentepohlia nox* bears a considerable resemblance to *T. nigricolor*, sp. n., but is readily told by the coloration of the legs, wings, and abdomen, and the venational details, especially the very long sector and the short petiole of cell R_5.

Trentepohlia (*Trentepohlia*) *hyalina*, sp. n.

General coloration yellowish; posterior tibiæ with three powerful bristles before tip; wings hyaline or nearly so.

Female.—Length 6·6 mm.; wing 5·2 mm.

Rostrum and palpi yellow. Antennæ with the scapal segments yellow; flagellum broken. Head pale yellow.

Pronotum with long erect setæ. Mesonotum rather bright yellowish; humeral region and præscutal interspaces with erect setæ. Pleura yellow; mesopleura setiferous. Legs pale yellowish testaceous throughout; legs all detached, but what from analogous species would appear to be the posterior legs are armed as follows: femora at base with a series of about fifteen spinous bristles that are subequally spaced; tibiæ before tips with three very long and powerful black bristles that are about equidistant from one another and from the tibial apex. Wings nearly hyaline; costal and subcostal cells indistinctly yellowish; stigma lacking; veins brown, those in costal area more yellowish. Venation: Rs long, straight, in alignment with R_{4+5}; r connecting with R_{2+3} about one-half its length before the fork; petiole of cell R_5 about equal to basal deflection of Cu_1, the latter a short distance before the fork of M; fusion of Cu_2 and 1st A punctiform.

Abdomen brown, the basal tergites more yellowish.

Hab. Cameroun.

Holotype, ♀, Batanga, July 14, 1920 (*J. A. Reis*).

Trentepohlia (*Trentepohlia*) *pomeroyi*, sp. n.

General coloration brown, the pleura and lateral margins of the mesonotum yellow; tibiæ and tarsi obscure whitish; wings whitish subhyaline, marked with brown; the large cell 1st R_1 largely pale; cell R_2 largely dark-coloured; abdominal tergites dark brown, sternites obscure yellow, the caudal margins of the segments broadly dark brown.

Male.—Length about 5·5 mm.; wing 4·6 mm.

Female.—Length about 5 mm.; wing 5 mm.

Rostrum obscure yellow; palpi dark brown. Antennæ brownish black. Anterior part of vertex dark brown, the remainder pale brownish yellow.

Mesonotum brown medially, the lateral margins brightening into yellow, the scutellum and postnotum darker brown. Pleura testaceous yellow, the mesosternum a little darker. Halteres dark brown, the base of the stem yellow. Legs with the coxæ rather bright yellow; trochanters testaceous; femora brown, the tips very narrowly and indistinctly paler; tibiæ and tarsi obscure whitish; in the types only the fore and middle legs are attached, and in these the tibiæ are unarmed. Wings whitish subhyaline, in the female the costal and subcostal cells more yellowish, in the male more brownish; conspicuous brown seams at the origin of Rs, tip of R_1, and r, continued as paler brown seams along Rs, R_{2+3}, the cord, and Cu; the wing-tip in cells R_2, R_3, and R_5 is pale brown, the centre of cell R_2 sometimes paler; veins dark brown; in the female, veins C, Sc, R, and the distal section of R_{2+3} yellow; cell 1st R_1 is large and with the centre conspicuously pale. Venation: Rs longer than the first section of R_{2+3}, cell 1st R_1 consequently elongate-triangular; cell R_5 narrow, its petiole about twice

(♀) to thrice (♂) the basal deflection of M_{1+2}; basal deflection of Cu_1 before the fork of M; cell *2nd A* narrow.

Abdominal tergites dark brown; sternites obscure yellow, the caudal margins broadly dark brown.

Hab. Nigeria.

Holotype, ♂, Effon Forest, November 10, 1920 (*A. W. J. Pomeroy*).

Allotopotype, ♀.

"In holes in big trees." Species of crane-flies taken in these same situations include *Dicranomyia* (*Thrypticomyia*) *nigeriensis*, *Rhamphidia flavitarsis*, and *Megistocera filipes*.

Holotype in the collection of the British Museum (Natural History).

Trentepohlia pomeroyi is a very distinct species that finds its only close described relative in *T. exornata*, Bergroth, from which it is readily told by the diagnostic characters listed above. The fly is dedicated to the collector, my friend, Lieut. Arthur W. Jobbins Pomeroy, of the British Expeditionary Force.

Dolichopeza (*Trichodolichopeza*) *albogeniculata*, sp. n.

General coloration dark brown; palpi yellow; legs dark brown, the knees narrowly whitish; tarsi fading into yellowish; wings dark grey, stigma dark brown; wing-tip and veins seamed with brown; conspicuous obliterative areas before and beyond the stigma.

Female.—Length 10·4 mm.; wing 10·8 mm.

Frontal prolongation of the head brown; palpi yellow; the basal segment brown. Antennæ dark brown, the scapal segments yellow. Head brown.

Mesonotum dark brown, the humeral regions of the præscutum obscure yellow. Pleura badly crushed in the unique type, variegated with brown and obscure yellow. Halteres dark brown, the base of the stem yellow. Legs with the coxæ brown; femora dark brown, the tips narrowly but conspicuously whitish; tibiæ dark brown, the bases narrowly whitish, this area about equal in extent to the pale femoral tips; tarsi pale brownish yellow, becoming paler and more conspicuous toward the end of the organ; terminal tarsal segment brown. Wings dark grey, variegated with brown and whitish subhyaline; stigma dark brown; wing-tip in cells R_2 to Cu_1 narrowly seamed with dark brown; cord and longitudinal veins narrowly seamed with brown; whitish subhyaline obliterative areas before and beyond the stigma; conspicuous macrotrichiæ in cells R_2 to *2nd* M_2, most numerous in cell R_5 where they include about the outer half of the cell. Venation: *Rs* very short, almost transverse, about equal to *r–m*; distal section of R_2 obliterated; petiole of cell M_1 subequal to or a little longer than the petiole of cell *2nd* M_2; fusion of Cu_1 and *M* about four-fifths of the basal deflection of Cu_1.

Abdomen dark brown, the tergites with a conspicuous pale yellow lateral area beyond mid-length of the sclerite.

Hab. Uganda.

Holotype, ♀, Mabira Forest, Kyagwe Country, altitude 4000 feet, August 12, 1920 (*R. A. Dummer*).

"Bobbing up and down on a tree-trunk between the buttresses."

XENOTIPULA, gen. nov.

Frontal prolongation of the head short and stout; no nasus. Antennæ very short in both sexes, composed of 13 segments, the first flagellar segment conspicuously enlarged, suboval, narrow at the base, provided with a few scattered bristles; remaining flagellar segments small, irregularly cylindrical, the terminal three segments closely approximated. Palpi of moderate length, the terminal segment a little shorter than the third. Legs of the male much longer than those of the female; tibiæ with two conspicuous curved spurs. Wings with Sc_1 atrophied; tip of R_2 atrophied or nearly so; but two branches of media reaching the wing-margin. Wings of the female smaller than those of the male. Male hypopygium of simple structure, the pleural appendages spinose posteriorly at the base. Ovipositor with the valves short and fleshy.

Genotype.—*Xenotipula munroi*, sp. n. (Southern Ethiopian Region).

Xenotipula is a very peculiar genus of Tipuline crane-flies. Together with *Idiotipula*, Alexander (Natal), and *Pseudoleptotarsus*, Alexander (Australia), the genus is readily told from all other members of the subfamily Tipulinæ by the presence of only two branches of media. *Xenotipula* is told from *Idiotipula* by the tibial spurs, the very short antennæ in both sexes, the lack of vein Sc_1, and the fleshy ovipositor. The curious discrepancy in the size of the two sexes is discussed in the collector's field-notes following the specific description.

Xenotipula munroi, sp. n.

Male with the wings and legs much larger and longer than those of the female; general coloration brownish testaceous, the mesonotum unmarked with darker; wings yellowish grey; Sc_2 ending opposite mid-length of *Rs*; cell *1st* M_2 narrowed outwardly; cell *2nd A* moderate in width.

Male.—Length about 6–6·5 mm.; wing 8·5–9 mm. Fore leg, femur 4·6 mm.; tibia 5·5 mm.; hind leg, femur 6 mm.; tibia 5·4 mm.; tarsus about 18 mm.

Female.—Length 6 mm.; wing 5–6·3 mm. Hind leg, femur 3 mm.; tibia 3 mm.; tarsus about 5·5 mm.

Male.—Frontal prolongation of the head very short and stout, yellowish brown; nasus lacking; palpi light brown. Antennal scape light yellow; first flagellar segment testaceous; remainder of the flagellum dark brown. Head brown, broadly yellowish adjoining the inner margins of the eyes; vertex between the eyes very broad.

Mesonotum pale brownish testaceous without darker markings. Pleura pale testaceous yellow. Halteres light brown, the knobs a little darker. Legs with the coxæ pale testaceous yellow; trochanters pale yellow, each with a conspicuous brown spot on the posterior face; remainder of the legs testaceous brown; fore tibiæ a little longer than the fore femora; hind tibiæ shorter than the hind femora; tarsi very long and slender, the metatarsi alone much longer than the combined femur and tibia; claws small, simple. Wings with a strong yellowish-grey tinge; stigma darker, brown; veins brown. Venation: Sc_2 ending about opposite mid-length of *Rs*, Sc_1 lacking; *Rs* long, gently arcuated at origin; R_{2+3} about two-thirds of *Rs*; tip of R_1 subatrophied; outer section of R_2 atrophied or barely persistent; only two branches of media reach the wing-margin; cell *1st* M_2 long-pentagonal, narrowed outwardly, *m* being less than one-third the outer deflection of M_3; *m–cu* distinct; cell Cu_1 deep, Cu_2 being about one-half longer than the basal deflection of Cu_1; vein *2nd A* almost straight, cell *2nd A* of moderate width. Macrotrichiæ on the penultimate section of R_1, on R_{2+3}, R_3, and R_{4+5}.

Abdominal tergites pale brown, the caudal margins darker; sternites more yellowish testaceous. Hypopygium of simple structure. Ninth tergite short, the posterior margin notched, the surface and margin of the tergite with conspicuous bristles. Ninth sterno-pleurite elongate, the pleural appendages at the end, these latter flattened, the posterior margin at the base with a few stout black spines.

Female.—About equal in size of body to the male, but the wings smaller and the legs very small and slender. The abdomen is greatly distended with large eggs, which condition, together with the delicate nature of the wings, probably renders this sex flightless, at least until oviposition is accomplished. All of the females available for study are teneral, the wings being pale and badly folded, the venation less distinct than in the male but agreeing in all essentials. The teneral nature of the females would lead us to believe that copulation takes place while the female is still teneral, a condition found in many other Tipulidæ. Ovipositor with the valves very small and fleshy, the sternal valves extending beyond the tergal ones.

Hab. Natal.

Holotype, ♂, Ambleside, near Port Shepstone, August 23, 1920 (*H. K. Munro*).

Allotopotype, ♀.

Paratopotypes, 15 ♂'s, 5 ♀'s.

This very interesting species is dedicated to its collector, my friend, Mr. H. K. Munro. The collector's full notes on this species are of unusual interest.

"Found on Ambleside near Port Shepstone on steep hillside, some distance from river. Conditions very dry—rain had not yet begun. Hillside covered with original bush and trees, undergrowth not very dense. Ground covered thickly with dead leaves. Large numbers of this fly were observed, most of them flying very close to the ground, in fact touching the dead leaves, so that it was not possible to catch them by beating without getting so many leaves that the flies, which were very fragile, were ruined. A few were flying up among the bushes. I soon observed that all those flying were males, except only a very few females flying '*in cop.*' After watching them for some time I noticed the flying males congregated in indiscriminate *mêlées* in certain spots. When these were examined, I saw that on the ground at each spot was a female with a very greatly distended abdomen. One male was *in copula* and the rest were flying around.

"The legs of the males are longer than those of the females. Like many of the Tipulidæ, individual insects were hard to follow owing to their very light and cob-webby appearance."—*H. K. Munro.*

Tipula camerounensis, sp. n.

General coloration of mesonotum light brown; pleura whitish yellow; mesonotum densely covered with short setæ; wings pale grey; stigma dark brown; male hypopygium with the sclerites fused into a ring, the median lobe of the ninth tergite narrow, the tip split by a V-shaped notch into two flattened lobes.

Male.—Length 16·5 mm.; wing 17 mm.; antenna about 5 mm.

Frontal prolongation of the head ferruginous; palpi dark brown. Antennæ of moderate length, scape testaceous, flagellum dark brown. Head ferruginous brown.

Mesonotum light brown without darker markings, the surface densely covered with short setæ. Pleura pale whitish yellow, unmarked. Halteres dark brown. Legs with the coxæ and trochanters testaceous; remainder of legs brown; claws of male apparently simple. Wings with a uniformly pale grey tinge; cell *Sc* brownish yellow; an inconspicuous brown seam along *r–m* and the basal deflection of R_{4+5}; stigma narrow, dark brown; veins dark brown. Venation: *Rs* short, about as long as the petiole of cell M_1; cell R_2 shorter than R_3, the proximal end acute.

Abdominal tergites dark brown, the sternites more yellowish; hypopygium brownish yellow. Male hypopygium as in this group of species, the sclerites fused into a ring; ninth tergite with the median lobe produced into a narrow depressed blade, the apex split into two flattened lobes.

Hab. Cameroun.

Holotype, ♂, Elat, 1920 (*J. A. Reis*).

Tipula oryx, sp. n.

General coloration liver-brown, the pleura yellowish striped longitudinally with dark brown; mesosternum dark brown; wings pale grey, the costal and subcostal cells dark brown; abdomen with a brownish-black subterminal ring; male hypopygium with the sclerites of the ninth segment fused into a ring; median lobe of the ninth tergite narrow, the caudal margin with a U-shaped notch.

Male.—Length 21 mm.; wing 19 mm.; antenna about 10 mm.

Frontal prolongation of the head dull rufous, darker laterally; palpi dark brown. Antennæ very long and slender, if bent backward extending almost to mid-length of the abdomen; first scapal segment fulvous; second segment fulvous; remainder of the organ dark brown. Head fulvous.

Mesonotal præscutum and scutum liver-brown, margined sublaterally with black, the extreme lateral margins pale; scutellum greenish testaceous medially; postnotum with the median sclerite dull fulvous, margined with dark brown. Pleura yellowish, marked longitudinally with dark brown, this colour extending across the dorsal margin of the lateral sclerite of the postnotum. Mesosternum dark brown, yellowish medially. Halteres dark brown, the extreme base paler. Legs with the coxæ dark brown on the outer face, the apices yellow; trochanters yellow; remainder of legs brown; femoral tips broadly brownish black; claws of male toothed. Wings with a pale grey tinge, the costal cell brown, the subcostal cell and stigma dark brown; a faint brown seam along $r\text{–}m$ and the deflection of R_{4+5}. Venation: Rs shorter than R_{2+3}; petiole of cell M_1 shorter than m.

Abdomen brownish testaceous, the caudal margins of the segments narrowly infuscated; segments 6 to 8 dark brownish black; hypopygium reddish yellow, with greenish tints. Male hypopygium with the sclerites fused into a ring. Ninth tergite with the elongate median lobe narrow, depressed, the caudal margin with a U-shaped notch, the adjacent lobes slightly divergent, unarmed.

Hab. Cameroun.

Holotype, ♂, Elat, 1920 (*J. A. Reis*).

XVI.—*Notes on the* Asilinæ *of the South African and Oriental Regions.* By GERTRUDE RICARDO.

Promachus beesoni, ♂ ♀, sp. n.

Type (male) and four other males, type (female) and one other female, all from Mohnyin River, Katha, Burmah (*C. F. C. Beeson*), caught between May 15th and 25th in 1918. In the Forest Research Zool. Coll. some of the specimens have the appearance of only just having emerged from the pupæ.

A large blackish species with long yellow hairs on the legs, which are chiefly black. Moustache, beard, and hairs of palpi yellow. Genitalia large, black-haired; ovipositor short. Abdomen with yellowish hairs on sides of basal segments.

Length, ♂ 32, ♀ 26 mm.—these latter are immature.

Male.—*Face* black covered with glistening yellow tomentum, tubercle large with a moustache of yellow bristly hairs and yellow bristles; these extend as yellow hairs to the base of antennæ. Beard yellow. *Palpi* with long yellow hairs. *Antennæ* blackish, the first two joints with yellow hairs on lower sides and some black ones above. *Forehead* with black and yellow bristly hairs on sides and with two or more weak yellow hairs on the ocelligerous tubercle. Hind part of head with black bristles, some yellow ones in the centre, continued round to the oral opening. *Thorax* black with some greyish tomentum and the usual stripes. *Scutellum* covered with weak yellow hairs or bristles and with long black bristles on the posterior part, but not bordering the edge, which is armed chiefly with the weak yellow or white bristles, though some of the specimens have some black bristles. *Abdomen* with the usual dark spots, appearing blackish with grey tomentose segmentations; the first four segments with yellowish hairs, thickest at the sides, in some of the specimens they are white, the remaining segments with short yellow recumbent pubescence and white hairs at the sides; underside with long pale yellowish or white hairs. *Genitalia* black, the upper forceps club-shaped with a segment-like base about half as wide as the last segment, furnished with a thick fringe of black hairs below, the lower forceps small, all with long black hairs. *Legs* blackish, the yellow hairs longest on the underside of the fore and middle femora and tibiæ; the fore femora with no bristles below; the tibiæ with appressed reddish pubescence on their inner sides; tarsi with black bristles, some yellow ones on the hind tibiæ; short yellow pubescence is apparent on the tibiæ and the first tarsal joints. *Wings* large, greyish, with a deeper grey tinge in the middle of the first submarginal cell, the small transverse vein below the middle of the discal cell.

Female identical. *Moustache* with black and yellow bristles. Palpi with black bristles, the hairs above yellow and then black at base of antennæ, the basal joints of which are clothed with chiefly black hairs. *Scutellum* with black bristles on dorsum and at edge. *Abdomen* with more grey than yellow hairs. Ovipositor short, but the abdomen is crumpled, so that it is difficult to ascertain if the last two segments are usually compressed, before the ovipositor proper. The yellow hairs on the legs do not appear to be so thick, all bristles are black.

Promachus pallidus, ♂ ♀, sp. n.

Type (male) and two others, type (female) and three others, all from the same locality and by the same collector as *Promachus beesoni*; none of them are very perfect, but appear immature—however, they are very distinct from the last-named species.

A light-coloured species with yellowish legs, the abdomen yellowish with brown spots.

Length, ♂ 23–24, ♀ 22–23 mm.

Male.—*Face* yellowish brown covered with yellowish and white glistening tomentum. *Moustache* of yellow bristles, sometimes a few black ones intermixed. *Palpi* yellowish and yellow-haired, some black hairs on the inner sides. *Antennæ* yellowish, the last two joints brownish, the first joint with black and yellow hairs, the hairs between them and the moustache are short and pale yellow. Hind part of head with chiefly black bristles in the centre and whitish hairs beyond. *Thorax* yellowish brown with two distinct darker median stripes; the whole dorsum clothed with short black bristles, with the usual long black bristles on the posterior part. *Scutellum* with weak white hairs and strong black bristles on dorsum and at edge, though white ones appear on the edge only in some specimens. *Abdomen* same colour as thorax and scutellum; the usual large spots are brownish and the segmentations yellowish; the pubescence of weak white hairs thickest on the basal segments and at their sides. *Genitalia* rather small, same colour as abdomen; the upper forceps stout, rather truncate at tips, the under pair stout, short, all with long black bristly hairs above and below. *Legs* pale chamois-leather colour; the knees black; femora and tibiæ with weak long white hairs, thickest on the first two pairs, the fore femora unarmed, all bristles black; pubescence on legs white. *Wings* clear, with one grey streak on the first submarginal cell, the small transverse vein at the middle of dorsal cell.

Female identical. *Palpi* darker, with chiefly black hairs. *Scutellum* with two rows of chiefly black bristles and short white hairs. *Legs* with not so many long hairs. *Ovipositor* short.

PHILODICUS, Loew.

Linn. Ent. iii. p. 391 (1848).

Distinguished from *Alcimus* by the shorter submarginal cell. Loew also divides it from this last genus by the much flatter ocelligerous tubercle, and the middle and side stripes of thorax are pubescent. The species are usually darker-coloured, and not so large as a rule, and the thorax is not so distinctly striped; but the division of these two genera appears based on rather unsatisfactory characters. *Alcimus ponticus* is now removed to this genus.

The genus is confined to the Oriental and South African Regions, with the exception of *Philodicus spectabilis*, Loew, from Turkestan, *Philodicus bimaculatus*, Becker, from Persia, and *Philodicus canescens*, Wlk., from Australia, and the above *Alcimus ponticus*, from Persia.

Table of Species of Philodicus *from South African Region.*

1.	Large species resembling an *Alcimus* species. Legs reddish with pale short pubescence ..	*dubius*, ♂ ♀, sp. n.
	Smaller species not resembling an *Alcimus* species	2.
2.	Slender species. Femora and tibiæ almost entirely rufous	*gracilis*, v. d. Wulp.
	Small species. Femora blackish with black bristles below on all. Tibiæ pale at extreme base only	*temerarius*, ♂ ♀, Wlk.
	Robust species. Femora black with black bristles below. Tibiæ dull red on outer sides	*walkeri*, ♀, sp. n.
3.	Femora not entirely black	4.
4.	Fore femora armed below with some bristles.	5.
	Fore femora with no bristles below	6.
5.	Fore femora with short white bristles below. Small slender species. Bristles on legs black and white. Femora and tibiæ reddish below	*fraterculus*, ♀, Wlk.
	Fore femora with pale or black bristles and long white hairs below. Tibiæ reddish. Bristles on legs chiefly black	*turinus*, ♂ ♀, Wlk.
	Fore femora in male with one black bristle near the base and soft white hairs below; female with two black and three yellow bristles. Femora and tibiæ reddish. Hind legs entirely black. Bristles on legs chiefly black	*nigrescens*, ♂ ♀, sp. n.
6.	Fore femora below with white bristly hairs near base and soft white hairs. Femora and tibiæ reddish below	*fraternus*, ♂ ♀, Wied.
	Fore femora below with only long white hairs, femora and tibiæ reddish on outsides. Shading of wing confined to apex.	*umbripennis*, ♂ ♀, sp. n.

Philodicus pavesii, Bezzi, from Somaliland, described as black with white tomentum, white bristles, and moustache and tibiæ testaceous, is unknown to me, as is *Philodicus blandus*, Wied., from unknown locality.

Philodicus dubius, ♂ ♀, sp. n.

Type (male) and another, type (female), all from M'Fongosi, Zululand (*W. E. Jones*), March 1911, in Cape Museum Coll.

A large species, in general appearance resembling an *Alcimus* species with a long body and short wings; the bristles on the legs are chiefly white.

Length, ♂ type 32, ♀ type 32 mm.

Male.—*Face* reddish with yellow tomentum. *Moustache* composed of yellow bristles and some finer white hairs, one black bristle near oral opening. *Palpi* with white hairs. Beard white. *Forehead* same colour as face with some yellow bristly hairs; soft white hairs below the *antennæ*, which are reddish with black hairs, the third black and bare. Hind part of head with reddish-yellow bristles. *Thorax* with the usual stripes, with black pubescence and longer fine white hairs posteriorly between the stout black bristles. *Scutellum* with two black bristles and short white hairs. *Abdomen* long and slender with the usual dark spots and pale segmentations; pubescence largely white, black on the middle of the dark spots; sides with yellow bristles. *Genitalia* reddish with thick, short, yellow pubescence. *Legs* reddish, femora blackish below, and hind tibiæ largely black; pubescence on legs thick short and pale-coloured; bristles chiefly white, black on the tarsi. *Wings* shorter than body, the shading in apex faint; veins brown.

Female identical; the bristles on scutellum are red. Fore femora have yellow bristles below, instead of fine hairs as in the male, and the yellow bristles predominate on the legs. *Ovipositor* short, reddish.

Philodicus gracilis, v. d. Wulp.

Trans. Ent. Soc. London, 1899, p. 92, pl. iii. fig. 5 (1899).

One female from Arabia (*Percival and Dodson*), 1900, 36. This specimen answers in all particulars to the description, with the small exception of the palpi, which are black, not rufous, and some of the bristles on the tarsi are white.

Philodicus temerarius, ♂ ♀, Walker.

Dipt. Ins. Saund. i. p. 121 (1851); et List Dipt. vii., Suppl. 3, p. 596 (1855) [*Trupanea*]; Loew, Dipt. Süd-Afrik. i. p. 127 (1860) [*Promachus*].

[*Philodicus obscuripes*, Loew, Dipt. Süd-Afrik. i. p. 139 (1860).]

Type (female) from Senegal (*W. W. Saunders*), other specimens from Ashanti, Duala in Cameroons, Sierra Leone, Liberia, and S. Nigeria, in I. E. E. Coll. from Kumasi. Ashanti; Nyasaland, Ibadan in S. Nigeria, and Gold Coast.

A small black species; the tibiæ paler at the extreme base only, the bristles on legs black. In the female the fore femora have two or three short black bristles below and soft white hairs. In the male there are usually two long black bristly hairs and yellow hairs.

Length, ♂ 15, ♀ 15–20 mm.

A series of males and females from Pretoria (*Miss J. Brincker*) differ slightly, the males having no black bristly hairs on fore femora below, in the female there are some black and white bristles; the tibiæ and tarsi on their outer sides have white bristles, and the tarsi some on the inside, the hind femora with them above and below. Moustache is white, but there are black bristles above towards the base of the antennæ; they are slightly larger, measuring in the males 17½–21 mm., in the females 18 mm.

Philodicus walkeri, ♀, Ricardo.

[*Asilus turinus*, ♀, Walker, List Dipt. ii. p. 407 (1849), in parte.]

Type (female) from Sierra Leone (presented by Rev. F. D. Morgan), other females from Bugama, Nigeria (*Dr. Annott*), and Sierra Leone (Walker Coll.).

This specimen placed with *Philodicus turinus* male type as the female type evidently is not the same species, though very nearly allied, the *legs* being more largely black with all black bristles; the tibiæ are dull rufous on their outer sides, black at the apices; the femora are wholly dark-coloured, all armed with black bristles; the pubescence on legs greyish, the oral opening with three or more black bristles.

The absence of the long yellow bristles on the fore tibiæ and fore tarsi distinguishes it at once from *Philodicus turinus*. Walker's description of this latter is more than usually inaccurate, no mention being made of these bristles in the male type, and the assertion that the wings in the female are longer than the body is incorrect.

Length 23–27 mm.

Philodicus fraterculus, ♀, Walker.

List Dipt. vii., Suppl. 3, p. 597 [*Trupanea*] (1855).

One female (type) from Port Natal.

One male from Junction Blaauw Krantz and Tugela

River, Natal, Oct. 1896 (*G. A. K. Marshall*), is probably the male of this species.

A small species, measuring 18 mm.

Female.—*Antennæ* blackish with black hairs. *Moustache* yellow. *Forehead* with black and yellow bristles on each side. Hind part of head with white hairs below the stout black bristles. *Thorax* yellowish brown with two narrow median stripes and the usual side-stripes. *Scutellum* with two black bristles. *Abdomen* blackish covered with whitish tomentum, the usual spots are present; pubescence on dorsum rather abundant, white, very short. *Ovipositor* black, long; bristles at sides white, only present apparently on the first two segments, but the type is in poor condition. *Legs* blackish, femora reddish below and on outer sides, tibiæ the same, tarsi reddish; pubescence on legs thick, white, the bristles are black and white, those on the fore femora or underside white, many white ones on tibiæ and tarsi. *Wings* shorter than abdomen, the usual shading at apex. The male mentioned above is probably this species, the *genitalia* stout reddish with yellow short pubescence; abdomen is more reddish.

Loew's species, *Philodicus tenuipes*, might possibly be identical with this species, but he speaks of the colour of the insect as yellowish with white tomentum; his specimen came from Kaffraria.

Philodicus turinus, ♂, Walker.

List Dipt. ii. p. 407 [*Asilus*] (1849); et vii., Suppl. 3, p. 597 [*Asilus*] (1855); Loew, Dipt. Sud-Afrik. i. p. 127 (1860) [*Promachus*].

Type (male) from Sierra Leone (presented by Rev. D. F. Morgan).

Males and females from Yaba, Gold Coast; Lagos; N. and S. Nigeria; and British E. Africa; in I. E. E. Coll. from N. Territories, Gold Coast; and Nyasaland (*J. T. Simpson* and others).

The type is in bad condition and the fore femora are more reddish than black below, whereas in the other specimens the fore femora are chiefly black; in other respects these specimens agree with the type. The species is distinguished by the yellow or reddish long bristles on the fore tibiæ and tarsi; the fore femora are armed with some bristles on the under surface.

Length, ♂ 21–26, ♀ 23–27 mm.

Male.—*Face* blackish, covered with greyish tomentum, yellower at the sides. *Moustache* composed of long yellow bristles, with occasionally a black one intermixed, and at sides of oral opening there are one or two stout black bristles in some of the specimens; in the type they are all yellow. *Palpi* blackish with yellow hairs. Beard white. A few yellow hairs are continued from the moustache to the base of antennæ, which last are dark with black hairs on the first two joints. *Forehead* with black bristles at sides. *Thorax* blackish covered with grey tomentum, the median stripe divided and the side-stripes appearing as four black spots; pubescence on dorsum black, with strong black bristles posteriorly. *Scutellum* with two black bristles. *Abdomen* with the usual dark spots and greyish segmentations; pubescence black and yellowish, bristles at sides of segments yellow; underside uniformly light in colour. *Genitalia* black with grey pubescence, reddish on the underside. *Legs* black, the tibiæ reddish, only black at the extreme apex; in some specimens the inner sides are blackish and the hind pair are almost always largely black, the bristles on fore femora below are red or yellow in the type, often black in the other specimens; pubescence of legs greyish and yellow, the yellow bristles on fore tibiæ are long, usually three or four in number, and are continued on the tarsi often on each side, on the tibiæ they are on the outer edge, bristles elsewhere chiefly black, with the exception of those on the hind femora. *Wings* with grey shading on the apex, very distinct.

Female identical. *Ovipositor* black, shining, with the usual terminal spines. In some specimens the yellow bristles on fore femora are reduced to one.

Philodicus nigrescens, ♂ ♀, sp. n.

Type (male) and others, type (female) and others, all from Lualaba River, Congo, 2500–4000 feet (Neave Coll.).

A blackish fair-sized species. Legs blackish, the femora and tibiæ of the anterior legs reddish, fore tibiæ and tarsi with some long yellow bristles. Fore femora on male with soft white hairs and one black bristle near the base; female with two black ones and three yellow ones.

Length, ♂ 20–24, ♀ 20–23 mm.

Male.—*Face* brown with yellowish-grey tomentum, chiefly at sides. *Moustache* composed of long yellow bristles and two long black ones on each side. *Palpi* with white hairs. *Antennæ* broken off, the first two joints black with black bristly hairs, a few yellow hairs on face below. *Forehead* with black bristles at sides. *Thorax* brownish with grey tomentum, yellower at the sides, the brown median stripe is divided into two narrow ones, side-stripes composed of blackish spots as usual, three in number; pubescence on dorsum black, a few white hairs near the black bristles at posterior border. *Scutellum* the same as thorax with two black bristles. *Abdomen* dusky-looking, with the usual brown spots, the grey segmentations narrow, bristles at sides yellow. *Legs* blackish, the hind legs entirely so; femora and tibiæ elsewhere reddish below and on outer sides; tarsi blackish; pubescence on legs whitish and thick, bristles almost entirely black, with the exception of the two or more long yellow bristles on the fore tibiæ and those on the fore tarsi. *Wings* tinged yellow, the shading on apex prolonged on posterior border to fourth posterior cell.

Female identical, only one long yellow bristle on fore tibiæ.

Philodicus fraternus, Wied.

Zool. Mag. i. p. 3 [*Asilus*] (1819) etc.; Bigot in Thoms. Archiv. Ent. ii. p. 355 [*Philodicus*] (1858); Schiner, Verh. zool.-bot. Ges. Wien, xvi. p. 689 (1866), et xvii. p. 390 [*Alcimus*] (1867).

In spite of Schiner stating that the above is an *Alcimus* species—he having seen the type,—it appears from what Wiedemann says in his description that it undoubtedly belongs to this genus, as he remarks that the small transverse vein very near the base of the fork of the third vein is not so near as in *Alcimus hospes*, which latter is also, I believe, a species of this genus.

It appears to be a common species on the West Coast of Africa, judging from the series of specimens in the Brit. Mus. and I. E. E. Colls. ranging from Sierra Leone to Nigeria; Gambia; Yapi, Soro River, N. Territories, Gold Coast; and Cotonen in Dahomey 70 miles west of Lagos. One female from Chinde, Mozambique, in South African Museum Coll. (*K. H. Barnard*).

A blackish species with black legs; the femora red on the under sides and outer sides, and the tibiæ the same; tarsi reddish with black apices. Wiedemann makes no mention of the colour of the bristles on the legs; they are usually all black on the hind legs, with some white bristles on the others intermixed with the black ones. The fore tibiæ and tarsi have long yellow or reddish bristles as in *Philodicus turinus*, in the female they are often more largely white in colour; the fore femora on the underside usually with one or more white bristly hairs near the base and fine white hairs.

Length, ♂ 19–20, ♀ 19–24 mm.

Wiedemann only described the male; the female is identical—ovipositor long, black.

Philodicus umbripennis, sp. n.

Type (male), type (female), from S.W. Nyasa (*R. Webb*), 96, 261; another male from Nyasaland, Nov. 1892 (*H. H. Johnston*), 94, 12; another female from Nyasaland (*Dr. H. G. Eldred*).

A reddish-black species, distinguished by the shading on apex of wings not being continued in streaks, but only present at apex, becoming paler on its posterior border. Legs blackish; femora and tibiæ partly red.

Length, ♂ 20, ♀ 20–22 mm.

Male.—*Face* covered with yellow tomentum. *Moustache* composed of yellow bristles, with five or six black ones on each side near oral opening. *Palpi* with long white hairs. *Antennæ* reddish, the third joint brown, the first two joints with black hairs. *Forehead* with yellow hairs, also present below antennæ, a few weak black bristles also present at sides of forehead. Hind part of head with some white bristles above the black ones. *Thorax* covered with pale tomentum, the median brown stripe divided in the middle; dorsum of thorax and scutellum covered with short black pubescence, the two bristles on the latter black. *Abdomen* with the usual spots, reddish brown in colour with broad grey segmentations; pubescence black, rather thick, and yellow on the pale parts; bristles at sides white. *Genitalia* reddish with black pubescence above and yellow below. *Legs* blackish, the outer sides of all femora and tibiæ red; tarsi reddish; pubescence on legs whitish, long underneath the fore femora and fore tibiæ; bristles chiefly black, some longer white ones on the fore legs. *Wings* clear; veins yellowish.

Female identical. *Genitalia* long, reddish brown. Hind femora with some white bristles, the fore femora with some weak, yellow, bristly hairs.

Table for Species of Philodicus *from the Oriental Region.*

1. Legs black and red .... 2.
   Legs wholly black .... 3.
2. Very large species, tibiæ partly rufous, ovipositor with large side-spines .... *grandissimus*, ♂ ♀, sp. n.
3. Fore femora armed with bristles below. 4.
   Fore femora with no such bristles below. 6.

4. Robust species. Anterior and middle femora and tibiæ red below and on outside, posterior tibiæ red on the outside	*javanus*, Wied.
Slender, small species	5.
5. Femora and tibiæ reddish below	*meridionalis*, ♂ ♀, sp. n.
Legs darker than in *meridionalis*, the red colour being very dull rufous	*fuscipes*, ♂ ♀, sp. n.
6. Transverse vein very near base of first submarginal cell, so that the second submarginal cell is nearly as long as the first one. Fore femora and tibiæ partly red below, bristles on legs black and white	*hospes*, Wied.
Second submarginal cell the same length as is usual in this genus	7.
7. Large robust species. Fore and middle tibiæ almost wholly obscurely red, bristles all black	*thoracicus*, ♂ ♀, sp. n.
8. Fore femora armed with bristles below.	9.
Fore femora with no such bristles below.	10.
9. Large species, the bristles on fore femora below, stout, black. Moustache yellow.	*univentris*, ♂, Wlk.
Smaller species, the bristles on fore femora below in male weak, white, in female stouter and black or white. Moustache white	*femoralis*, ♂ ♀, sp. n.
10. Scutellum with no bristles	11.
Scutellum with four or more bristles	12.
Scutellum with the usual two bristles	13.
11. Medium-sized black species with quite clear wings. Scutellum with thick white hairs	*pallidipennis*, ♂, sp. n.
12. Larger robust species. Moustache black and white. Scutellum with black hairs and a fringe of black bristles on the border	*chinensis*, Schiner.
Slighter species. Moustache white	*longipes*, Schiner.
13. Smaller species. Moustache black and white. Scutellum with black hairs and two black bristles on border	*ceylonicus*, Schiner.

Promachus ceylonicus, Macq. (see Ricardo, Ann. & Mag. Nat. Hist. (9) v. p. 213 (1920)), I have not been able to identify as a species of *Philodicus*.

Asilus albispina, Thomson, from the description, probably belongs to this genus, as the author says it is near *Asilus agnitus*, Wied., which is now said to be a synonym of *Philodicus javanus*. Thomson's type came from Manila.

Promachus leucotrichodes, Bigot, and *Promachus tristis*, Bigot, both from India, sound from the description as if they might belong to this genus, rather than to *Promachus*, but I have not been able to identify them from the descriptions. The former is described as having an ashy-grey narrow and elongate abdomen, with two black spots on each segment.* Legs black with black bristles, and the latter only differs in having white bristles on the legs; ovipositor in both with two spines at end.

Philodicus grandissimus, ♂ ♀, sp. n.

Types male and female from Disa, Bombay Presidency (*Major G. C. Nurse*).

One female from Tippanur, Kurinool District (T. V. R. Coll.), in I. E. E. Coll.

A very large species for this genus, but it appears in other respects a true *Philodicus*. The ovipositor has not a regular circlet of spines, the side-ones being much larger. Legs blackish, only the tibiæ dull rufous on the outer side.

Length, ♂ 32, ♀ 36 mm.

Male.—*Face* covered with greyish-white tomentum. *Palpi* black with white hairs. *Moustache* composed of pale yellowish, rather weak bristles with weak white hairs beyond, reaching the base of the antennæ, which are incomplete, the first joint black covered with grey tomentum, the second reddish, both with black hairs and bristles. *Forehead* same colour as face with white hairs, some rather bristly. Hind part of head with all bristles and hairs white. Beard white. *Thorax* with two well-marked brown stripes, narrow, on a blackish-coloured dorsum covered with grey and brown tomentum, side-stripes small; pubescence short, black, some white hairs on posterior part. *Scutellum* with two black bristles and white hairs. *Abdomen* the usual colouring, appearing blackish brown with grey segmentations; pubescence wholly white, bristles at sides white. *Genitalia* and the preceding segment black, shining, with white pubescence and hairs. *Legs* blackish, but covered with dense white pubescence; the femora below at extreme apices somewhat rufous like the tibiæ; fore femora below with weak white bristly hairs, all bristles black, except some on the coxæ. *Wings* tinged somewhat yellow, grey at apex; veins yellowish red.

Female identical. *Ovipositor* black, shining; the spines at sides very stout, one predominates in length, those at apex very short.

Philodicus javanus, Wied.

Zool. Mag. i. pp. 3, 4, 5 [*Asilus*] (1819), etc.
Philodicus ? *agnitus*, Wied. Zool. Mag. i. pp. 3, 35 [*Asilus*] (1819).
Philodicus perplexus, Wied. Auss. zweifl. Ins. i. p. 405 [*Asilus*] (1828).

Philodicus rubritarsatus, Macq. Dipt. Exot. i. (2) p. 215 [*Trupanea*] (1838).

✓ *Philodicus gobares*, Wlk. List Dipt. ii. p. 420 [*Asilus*] (1838); et vii., Suppl. 3, p. 604 [*Trupanea*] (1855).

✓ *Philodicus telifer*, Wlk. Ins. Saund., Dipt. i. p. 115 [*Trupanea*] (1851); et List Dipt. vii., Suppl. 3, p. 606 [*Trupanea*] (1855).

✓ *Philodicus sagittifer*, Wlk. Ins. Saund., Dipt. i. p. 116 [*Trupanea*] (1851); et List Dipt. vii., Suppl. 3, p. 606 [*Trupanea*] (1855).

✓ *Philodicus innotabilis*, Wlk. List Dipt. vii., Suppl. 3, p. 604 [*Trupanea*] (1855).

✓ *Philodicus confinis*, Wlk. List Dipt. vii., Suppl. 3, p. 606 [*Trupanea*] (1855).

Philodicus melanurus, Dol. Natur. Tyd. Nederland Ind. n. ser. vii. (x.) p. 408, pl. vi. fig. 2 [*Asilus*] (1856).

Philodicus inserens, Wlk. Proc. Linn. Soc. London, i. p. 116 [*Trupanea*] (1857).

The type of *gobares* is a female from Silhet.

The type of *telifer* is a female from East India.

The type of *sagittifer* is a female with another male and female from East India (Walker Coll.).

The type of *innotabilis* is a female with two males and one female from Java and Sumatra.

The type of *confinis* is a male from Java.

The types of *inserens* are male and female from Sarawak; these are rather small, only measuring 18 mm., whereas the usual length is 20–22 mm., though v. d. Wulp mentions some he had from Java as only 14 mm. long.

The species described by Macquart as *Trupanea fuscus*, Dipt. Exot. i. p. 220, from Bengal, is very probably another synonym of this species, but the description is too meagre to identify the type without seeing it. Schiner records it from Batavia in Novara Reise, Dipt. p. 178.

Besides the Walker types there are specimens in the Brit. Mus. Coll. from Java, Johore, Khasi Hills, Assam, and Kungra Valley, N. India. In the Imms Coll. are specimens from Kumaon, N. India.

This species is said by v. d. Wulp to be common in the East Indies, and evidently has a wide range; it has already been recorded from Java, Sumatra, and Borneo, and appears to reach India and Assam.

A robust species; the moustache not black, as stated by Wiedemann, but yellow with a few black bristles near the oral opening, as stated by v. d. Wulp.

Legs black; the anterior legs with the femora and tibiæ reddish below and on the outside; the posterior tibiæ red on the upperside; the bristles chiefly black, a few white ones occasionally, usually one long one on the fore tibiæ on outside; fore femora below with three or more black bristles and yellowish-white hairs; in the female the bristles are often yellow. *Wings* tinged yellow; apex and posterior border greyish. *Ovipositor* short, black. *Abdomen* with white bristles at sides.

Length 20–22 mm.

A small blackish species; the second submarginal cell nearly as long as the first, but distinctly shorter. *Moustache* white, some black bristles near oral opening. *Abdomen* with the usual dark spots and grey segmentations. *Legs* blackish, thickly covered with white pubescence; fore femora below at apices and fore tibiæ below at base reddish; fore femora unarmed, with long white hairs below, fore tibiæ with golden-yellow appressed pubescence below; hind femora at base with some yellow bristles, also the coxæ; on the fore tarsi appear a few white bristles in some specimens, and on the fore tibiæ, otherwise the bristles are black.

Length 19 mm., as given by Wiedemann.

Philodicus meridionalis, ♂ ♀, sp. n.

This and the following species are both very nearly allied to *Philodicus hospes*, but differ by the second submarginal cell being shorter, the transverse vein being about the usual distance from the base in this genus. All the three species are small, with abdomen blackish with grey segmentations. This species has black legs, the femora and tibiæ reddish below; the bristles on the legs black and white; the fore femora with two black at the most below in the male with soft white hairs; the female has black and yellow bristles. Moustache yellow.

Length, ♂ 12–15, ♀ 18 mm.

Types male and female and others all from Ceylon (Yerbury Coll.).

In I. E. E. Coll. are males and females from Pattikonda, Kurinool District (J. V. R. Coll.); from Marugmala (C. N. Coll.); from Coimbatore (A. G. R. Coll., G. N. Coll.); Becravalli Bellary District (C. N. Coll.) and Palur Farm, S. Arcot District (P. S. Coll.), in South India.

Philodicus fuscipes, ♂ ♀, sp. n.

Types (male and female) and others from Biserat, Bidor, Putani Cape, Siam (*Robinson and Annandale*).

Length, ♂ 16, ♀ 16–18 mm.

A species very nearly allied to the above species from Ceylon, *P. meridionalis*.

Moustache yellow with two or more black bristles near the oral opening.

Legs darker than in *Philodicus meridionalis*, sp. n., the femora and tibiæ being very dull rufous below and on the outside. In the male the bristles are chiefly black; in the female black and white, the hind femora with white ones; there are long yellow bristles on the outer side of fore tibiæ in both sexes. Fore femora on underside in the male with yellow and black bristles, in the female with three white bristles.

Philodicus hospes, Wied.

Zool. Mag. i. pp. 3, 32, 47 [*Asilus*] (1819); Dipt. Exot. p. 207, 44 [*Asilus*] (1821); et Ausszweifl. Ins. i. p. 495 [*Asilus*] (1828); Schiner, Verh. zool-bot. Ges. Wien, xvi. p. 689 (1866); Roder, Ent. Nachricht. xix. p. 235 (1893).

This species has been placed in the genus *Alcimus*, and so appears in Kertesz's Cat., doubtless owing to the remark by Wiedemann that the transverse vein is very near the base of the first submarginal cell, which is true; but it is hardly as close as in species of *Alcimus*, and the species has all the appearance and characters of the genus *Philodicus*, to which it certainly belongs, though Schiner states that one female he saw in the Winthem Coll. belongs to the genus *Alcimus*. The specimens in the Brit. Mus. Coll. from Ceylon answer to Wiedemann's description, his specimens came from Tranquebar, and Röder records it from Ceylon. The genus *Alcimus* is, therefore, practically confined to the African Region.

In the Brit. Mus. Coll. are males and females from Trincomalee and Mahaganay, Ceylon (Yerbury Coll.).

Philodicus thoracicus, ♂ ♀, sp. n.

Types (male and female *in cop.*) from Trincomalee, Ceylon, and other males and females (Yerbury Coll.).

A medium-sized species distinguished by the broad median stripe not divided in the middle. Legs blackish; tibiæ rufous, the hind pair darker. Moustache white.

Length, ♂ 27, ♀ 28 mm.

Male.—*Face* covered with greyish-white tomentum, silvery at the sides. *Palpi* with white hairs. *Moustache* composed of yellowish-white bristles with two or more black ones near the oral opening; the hairs above are white, reaching the base of antennæ, ranged on the sides chiefly. *Antennæ* blackish, the second joint reddish, the first two joints with black bristles, the arista long. Hind part of head with black bristles, and a few weak white hairs below; white bristles appear beyond the vertex. Beard white. *Thorax* brownish with yellowish tomentum, the side-stripes small; pubescence on dorsum black, the hairs posteriorly chiefly black. *Scutellum* with two black bristles. *Abdomen* with the usual spots and grey segmentations appearing brownish; pubescence black on the brown spots and whitish on the segmentations; bristles at sides black with yellow ones below. *Genitalia* short, reddish brown, with black hairs and some whitish ones at apex; below appear long black hairs on the small red-brown segment preceding the genitalia. *Legs* blackish; the fore and middle tibiæ almost wholly rufous-coloured, the extreme apex of femora below reddish; fore femora practically unarmed, with soft white hairs; pubescence on legs dense, white, all bristles black. *Wings* clear with grey apex and posterior border; veins reddish yellow.

Female identical, the fore femora armed below with short black bristles; bristles at sides of abdomen apparently all yellow. *Ovipositor* black.

Philodicus univentris, ♂, Walker.

Ins. Saund., Dipt. i. p. 114 [*Trupanea*] (1851); et List Dipt. vii., Suppl. 3, p. 602 [*Trupanea*] (1855).

Type (male) from India (Walker Coll.).

A large robust species in very bad preservation. Legs black with greyish-yellow tomentum; fore femora armed with stout black bristles; all bristles on legs are black, those on the abdomen chiefly white. Moustache yellow.

Length 21 mm.

Philodicus femoralis, ♂ ♀, sp. n.

Type (male) from Okkyl, Schwegu, Burmah (*C. F. C. Beeson*).

Type (female) and another from Magaung, Myitkyina District, Upper Burmah (*Capt. Whitmore, I.M.S.*). Males and females from Dehra Dun and N. Toungoo, Burmah.

Length, ♂ 17–18, ♀ 19–23 mm.

A species distinguished from *Philodicus ceylonicus* by the white moustache with only two or three black bristles near the oral opening and by the presence of some white bristles on the legs; the fore femora have three or four very weak white ones, below intermixed with long white hairs, and the hind femora have a few short white ones below; also sometimes some are present in the middle tibiæ. Scutellum with two black bristles.

Female identical; fore femora with the bristles below much stouter and black or white, and this applies to the other femora.

Philodicus pallidipennis, ♂, sp. n.

Type (male) and another from Manora, Karachi (*F. W. Townsend*).

A small blackish species distinguished by the absence of the grey shading in apex of wing. Legs entirely black; bristles chiefly white. Scutellum with no black bristles.

Length 19 mm.

Face with grey-white tomentum. *Palpi* with long white hairs. *Moustache* composed of yellowish-white long hairs, not very bristly; the sides of face as far as antennæ with similar hairs also present in the centre. *Antennæ* blackish, the first two joints with whitish bristles, the third joint short and oval, the arista quite as long as the antennæ themselves. *Forehead* with similar hairs to those on the face. Hind part of head with white bristles. *Thorax* brownish with grey tomentum, the black median stripe divided; pubescence on dorsum white. *Scutellum* with thick long white hairs on dorsum and ranged along the whole posterior border, where no black bristles are present. *Abdomen* short, olive-brown, the usual spots not very distinct; pubescence short, white, thick, sides with some long yellowish hairs on basal segments and long yellow bristles above. *Genitalia* short, rather stout, black, with black pubescence and some yellow hairs at apex*; three reddish cylindrical pieces proceed from below and curl over top of genitalia. *Wings* clear; the type has one grey streak in the first submarginal cell, the other male has a wholly clear wing.

* This species may possibly require a genus to itself; the scutellum with hairs only and the wing clear differentiate it from others of the genus. Females may assist to assign it a proper place.

Philodicus chinensis, Schiner.

Novara Reise, Dipt. p. 179 (1868); v. d. Wulp, Tijd. v. Ent. xli. p. 134 (1898).

[*Trupanea separatus*, Wlk. List Dipt. vii., Suppl. 3, p. 611 (1855).]

Schiner described the species from Hongkong.

Type (female) of *separatus* was described by the author as from an unknown locality.

Males and females from Trincomalee, Ceylon (*Yerbury*). Male from Batu Pahat, near Johore (*H. N. Ridley*). Male from Dinding, Siam. Female from Toungoo, Burmah, in Forest Research Zool. Coll. Male from China (*J. J. Walker*).

The species has been recorded from Singapore.

A medium-sized robust species with black legs. Scutellum covered with black hairs and with a fringe of black bristles on the border, four in number at least, not common in this genus. Fore femora unarmed. Moustache black and white.

Schiner gives the length as 12·13 mm.; these are from 16–18 mm.

Philodicus longipes, Schiner.

Novara Reise, Dipt. p. 179 (1868); Ost.-Sack. B. Ent. Zeit. xxvi. p. 112 (1882).

One male from Albay, S.E. Luzon (*Whitehead Expedition*); one male from Los Banos, male and female from Cape Engano, N. Luzon (*J. Whitehead*); two females from Isabella, N. Luzon: all localities in Philippine Islands.

This species appears to be distinguished from *Philodicus chinensis*, Schiner, by its slighter narrower build. Moustache usually white. Schiner says the scutellum has two black bristles, and gives the length as 10 mm.; but these species are larger.

Bezzi (in 'Studies in Philippine Diptera,' i. p. 14, 1913) says it is an endemic species, and suggests *Erax integer*, Macq., from Manila, is the same.

Philodicus ceylonicus, Schiner.

Novara Reise, Dipt. p. 179 (1868).

Males and females from Trincomalee, Colombo, Kanthalia, and Kandy, in Ceylon (*Yerbury*).

Distinguished from *Philodicus chinensis* by having only two black bristles on the scutellum, and is usually smaller in size. Schiner gives 11 mm.; these range from 11–15 mm.

It seems very closely allied to the above species from the Philippines.

[To be continued.]

XVII.—*On some Additional Species of* Laius, *Guérin, from the Malayan Region* [*Coleoptera*]. By G. C. CHAMPION, F.Z.S.

ABOUT a fortnight after my paper on the genus *Laius* appeared in this Magazine, (9) vii. pp. 322–343, April 1921, a very interesting series of Malayan forms was received at the British Museum from Mr. C. F. Baker, of Los Baños, Luzon, Philippines. This set includes 14 species, 12 of which were new to the collection and 9 of them undescribed. It is advisable to name these insects at once and to incorporate them with the rest in the Museum. Seven belong to the *Intybia*-group, placed by me near the end of the genus; and one has the second tarsal joint of the ♂ produced into a long claw above, as in the same sex of *Attalus*, this being the first species of *Laius* seen by me with the tarsi thus formed. The Philippine *L. baeri*, Fairm. (1898), and *L. semidepressus*, Pic (1917), and various forms from Java, Celebes, Perak, &c., named by Pic, have not yet been found in the collections examined. For facility of reference Mr. Baker's numbers are quoted in the present paper. In addition to the species of *Laius* he has also sent a new *Hapalochrus* closely related to *H. orientalis*, described in the same number of the 'Annals,' p. 346 *. The Malayan material in the "Fry Collection," hitherto overlooked by me, has also furnished several more new species of the first-named genus.

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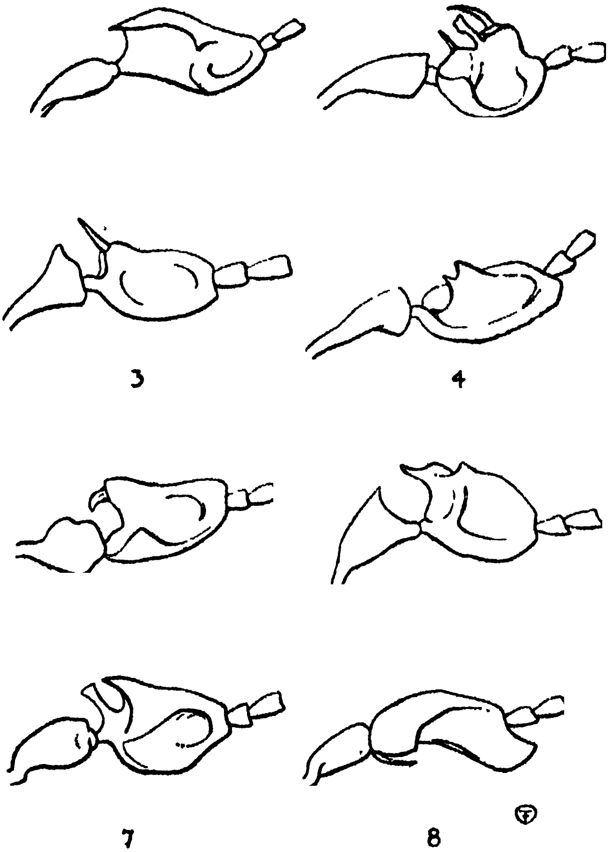
* *Hapalochrus megalops*, sp. n.—♂. Elongate, narrow, convex, shining, cinereo-pubescent, with scattered, longer, semierect hairs intermixed; bluish-green, the antennæ (the testaceous basal joints excepted), eyes, and legs black or piceous; the head and prothorax sparsely, the elytra densely, very finely punctured. Head a little broader than the prothorax, the eyes extremely large, separated by less than their own width as seen from above; antennæ long, flabellate. Prothorax transverse, rounded at the sides. Elytra long, slightly widening posteriorly. Anterior tibiæ hollowed near the apex within; anterior tarsal joint 2 extending over the base of 3 above; intermediate tibiæ widened, rounded externally, not sinuate within.

Length 3¼ mm.

Hab. SINGAPORE (*Baker*: No. 16161).

One male. Very like the S. Indian *H. orientalis*, Champ. [*l. c.* p. 346, no. 69 (*c*)], differing from it, in the ♂-sex, by the very much larger and more contiguous eyes, the pale basal joints of the antennæ, the widened, subarcuate intermediate tibiæ, and the finer puncturing of the elytra. The ♀ only of *H. orientalis* was described: the ♂, a specimen of which taken by Dr. Campbell at Yercaud, S. India, has just been presented to the British Museum by Mr. E. A. Butler, has, as anticipated, strongly flabellate antennæ; the anterior and intermediate tibiæ slender, and both hollowed near the apex within; the eyes moderately large and widely separated; and the body brilliant cyaneous above.



Antennal joints 1–4, ♂, of: 1. *L. alboarcuatus*; 2. *L. pictus*; 3. *L. dentatithorax*; 4. *L. subdentatus*; 5. *L. waterstradti*; 6. *L. quadristrigatus*; 7. *L. falcifer*; 8. *L. tetrastictus*, from behind.

Revised Key to the Malayan Species of Laius *with spotted Elytra* (Nos. 24–29, *l. c.* p. 324).

a^1. Elytra albo- or testaceo-maculate.
  aa. Anterior tarsi of ♂ simple.
    b^2. Upper surface shining; tarsi longer …… Species 24, 25.

*i*². Upper surface wholly or in part opaque; tarsi short. [Subgen. INTYBIA, Pasc.] ..	Species 26-29 (*a*-*i*).
bb. Anterior tarsi of ♂ with joint 2 prolonged or raised over the base of 3. [Subgen. DICRANOLAIUS, n.]	
*j*². Upper surface shining; tarsi longer	Species 29 (*j*).
*k*². Upper surface opaque; tarsi short........	Species 29 (*k*-*m*).

2 (*a*). *Laius submarinus*, sp. n.

♀. Smaller, less elongate, and more shining than the ♀ of the Malayan insect identified by me as *L.* (*Paussus*) *flavicornis*, F., antea p. 325, the antennal joints 1 and 2 differently shaped: bluish-green, the elytra cyaneous, the anterior margin of the head, the labrum, palpi, and the antennal joints 1–3, rufo-testaceous, the rest of the antennæ and the legs black; cinereo-pubescent, the head and prothorax densely, very finely, the elytra excessively minutely, punctate; head small, canaliculate; antennal joint 1 shorter, more curved, and more dilated outwards, and 2 relatively shorter, broader, and more rounded on its inner aspect, than in *L. flavicornis* (♀); prothorax transverse, less rounded at the sides; elytra comparatively short, parallel.

Length 3¼ mm.

♂. Antennæ (figs. 9, 9 *a*) with joint 1 long, curved, compressed, broadly truncato-dilatate in its outer half externally; 2 enormously dilated, transverse, subquadrate as seen from its upper aspect, emarginate and deeply concave on its basal aspect, the strongly reflexed inner and outer margins produced into two converging blunt processes at the base above. Anterior femora hollowed at the apex beneath; anterior tibiæ curved, greatly swollen at about the middle, convex externally, sinuato-excavate at the base within; anterior tarsi simple.

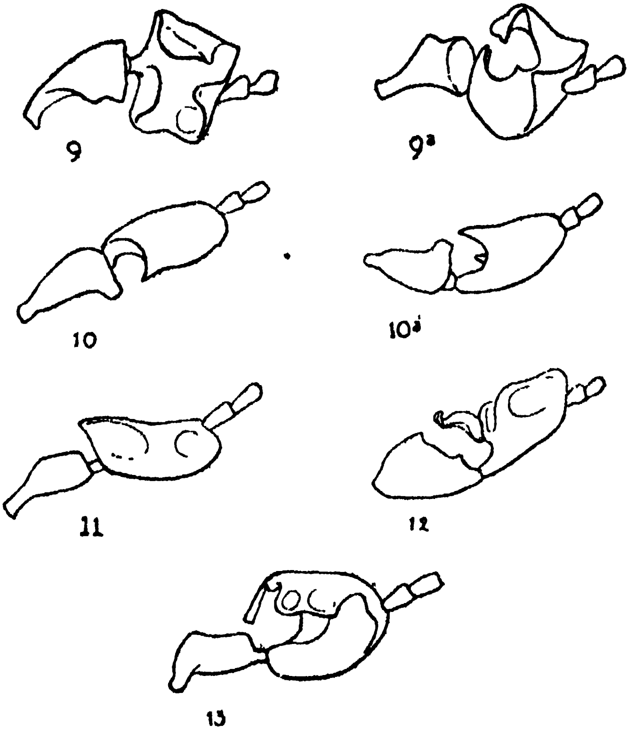
Hab. PHILIPPINES, Mindanao (*Semper*: ♂ ♀), Dapitan, Mindanao (*Baker*: No. 16160: ♀).

One ♂ and two ♀ ♀ seen; others are presumably contained in Mr. Baker's collection. Certainly distinct from *L. flavicornis*, several ♂ and ♀ specimens of which are before me.

"Lives in cracks and holes of sandstone that reach pretty far out into the sea, quite covered during the flood-tide but dry during the ebb." (*Semper.*)

6 (*a*). *Laius alboarcuatus*, sp. n.

♂. Moderately elongate, widened posteriorly, the head shining, the prothorax and elytra opaque, finely pubescent; nigro-piceous or black, the head, antennæ, prothorax, and



Antennal joints 1-4, ♂, of. 9, 9 *a*. *L. submarinus*, from different aspects; 10, 10 *a*. *L. alboplagiatus*, from above and behind; 11. *L. semperi*; 12. *L. flavonotatus*, from behind; 13. *L. erythrocephalus*.

legs (the infuscate tibiæ excepted) testaceous or rufo-testaceous, the elytra each with a narrow, arcuate, transverse, whitish fascia (extending to the outer margin, but not reaching the suture) before the apex; the head rather sparsely, minutely, the rest of the upper surface densely, rugulosely, punctate. Head triangular, about as wide as the prothorax, canaliculate, the eyes prominent and rather large; antennæ (fig. 1) long, joint 1 strongly curved, moderately dilated outwards, 2 enormously developed, elongate, oblique, somewhat scaphiform, concave, reflexed and angularly produced at the inner basal angle, 3–10 filiform. Prothorax transverse, subcordate, the arcuate basal depression deep. Elytra moderately long, convex. Legs short; anterior tarsi simple.

♀. Antennæ wholly or in part testaceous, rather stout, tapering outwards, joint 2 thickened, elongate, subcylindrical.

Length $2\frac{1}{3}$–$2\frac{2}{3}$ mm. (♂ ♀.)

Hab. PHILIPPINES, Mt. Makiling, Luzon [type ♂], Los Baños [♀] (*Baker*: No. 1149).

One ♂, two ♀ ♀. Not unlike the Indian *L. nodifrons* and *L. testaceiceps*; but with the elytra black and albo-unifasciate near the apex, and the puncturing much finer and denser, the tarsi short as in *Intybia.*

23 (*a*). *Laius rectefasciatus*, sp. n.

♀. Elongate, widened posteriorly, the head and prothorax shining, the elytra opaque, finely pubescent; piceous, the head and prothorax, the suture and the basal, apical, and lateral margins of the elytra, the four basal joints of the antennæ in part, and the bases of the femora to a greater or less extent, testaceous or rufo-testaceous, the elytra each with two straight, transverse, whitish fasciæ extending to the outer margin; the head and prothorax closely, the elytra densely, rugulosely, punctate. Head triangular, about as wide as the prothorax, canaliculate, the eyes prominent; antennæ rather stout, tapering outwards, joint 2 elongate, much thickened, subcylindrical. Prothorax about as long as broad, subcordate, unarmed at the sides, the arcuate basal depression deep. Elytra moderately elongate, rather convex. Legs short.

Length $2\frac{4}{5}$–3 mm.

Hab. PHILIPPINES, Iligan, Mindanao (*Baker*: No. 4282).

Two ♀ ♀. The elytral markings in this insect are rather like those of the Indian *L. jucundus*, Bourg., except that the whitish fasciæ are quite straight and not connected along the suture. The surface-sculpture is dense and very fine, as in the species of the *Intybia*-group.

23 (*b*). *Laius variipes*, sp. n.

♀. Elongate, narrow, rather convex, widened posteriorly, the head and prothorax somewhat shining, the elytra opaque, finely pubescent; the head, prothorax, the antennal joints 1–6, femora, and tarsi testaceous or flavous, the rest of the antennæ, the palpi, and tibiæ piceous or black; the elytra piceous, with the base, outer limb, and apical margin, and the sutural region broadly and indeterminately, testaceous, and each with two large, transverse, whitish fasciæ on the outer part of the disc, the subapical one curving forwards externally; densely, minutely, the elytra rugulosely punctate. Head grooved in the middle between the eyes; antennæ long, stout, tapering towards the apex, joint 2 very stout, elongate, subcylindrical, 7–10 also elongate. Prothorax convex, elongato-cordate, rather narrow, deeply, transversely depressed before the base. Elytra long, widest towards the apex. Legs comparatively short, rather stout, the posterior tibiæ feebly curved.

Length 2⅞ mm.

Hab. Assam, Patkai Mts. (*Doherty*).

One specimen. Very like the Philippine *L. rectefasciatus*, the antennæ and legs differently coloured, the prothorax narrower, elongate, and more narrowed behind, the whitish elytral fasciæ broader, the antennæ (♀) longer.

24. *Laius pictus*.

Laius pictus, Er. Entomographien, p. 63 (♂) (1840)[1].
Var. *Laius duplex*, Champ. Ann. & Mag. Nat. Hist. (9) vii. p. 339 (♂) (April 1921)[2].

♂. Antennal joint 1 curved, triangularly dilated outwards, 2 very broad, ear-shaped, rounded as seen from above, deeply excavate, the inner margin recurved and furnished with two slender appendages and a small tooth (fig. 2); head deeply foveate in the middle between the eyes; anterior tarsi simple.

Hab. Java[1 2]; Philippines, Los Baños (*P. I. Baker*: ♂: No. 1654); Palawan, Puerto Princesa (*Baker*: ♀: Nos. 4283, 16753); Borneo, Pengaron (*Doherty*: ♂); Formosa.

Two ♂ ♂ and 3 ♀ ♀ of this species have been sent by Mr. Baker. The elytral markings are variable in colour and shape: the outwardly-dilated ante-median patch is red and bordered with white within in the type of *L. pictus* and in the three examples from Palawan, uniformly reddish in those from Los Baños, and whitish in the types of *L. duplex*; the subapical spot is rounded in *L. pictus* and transverse in *L. duplex*, intermediate forms occurring.

26 (*a*). *Laius hexastigma*, sp. n.

♀. Moderately elongate, much widened posteriorly, opaque, finely pubescent, densely, minutely, rugulosely punctate; piceous or black, the basal half of the antennæ, the front of the head, the tarsi, and the anterior and intermediate femora and tibiæ in part, testaceous, the elytra each with three whitish spots—one, transverse, before the middle, the other two, rounded, near the apex, transversely placed, the outer one smaller than the inner. Head triangular, not wider than the prothorax, obsoletely canaliculate, the eyes not very prominent; antennæ long, tapering outwards, joint 2 elongate, much thickened, subcylindrical. Prothorax as broad as long, rounded and unarmed at the sides. Elytra rather convex, moderately long. Wings present. Legs short; anterior tarsi simple.

Length 2–2½ mm.

Hab. BORNEO, Sandakan (*Baker*: No. 16159).

Three ♀ ♀. The elytra in that insect are each albotrimaculate, as in *L.* (*Intybia*) *guttatus*, Pasc., type ♀, from Sarawak (*Wallace*), except that the apical spots are smaller, the present species having a much smaller head, an unarmed prothorax, longer, less inflated elytra, and fully developed wings. The 4-spotted *L. borneensis*, Pic (1910), also has the front of the head testaceous.

29 (*a*). *Laius quadriguttatus.*

Laius quadriguttatus, Er. Entomographien, p. 64 (♂) (1840); Pic, L'Echange, xxvi. p. 83 (1910).

♂. Antennæ rufo-testaceæ, articulis ultimis 3 vel 4 nigricantibus, tertio subovato, interne cavo. [*Erichson.*]

Hab. SINGAPORE (*Baker*: ♀: No. 16157), Bintang Island [type].

A ♀ sent by Mr. Baker agrees very nearly with the description. It has the antennæ stout, rufo-testaceous, except joints 7–10 and the base of 1, 2 being much thickened, elongate, and subcylindrical; the head black (said by

Pic to be testaceous in front); the elytral spots flavous (white in the type), the anterior one transverse and reaching the outer margin, the subapical one rounded.

29 (*b*). *Laius dentatithorax*.

Laius dentatithorax, Pic, Mélanges exot.-entom. xxv. p. 5 (♂) (Aug 1917).

♂. Antennal joint 1 broadly, triangularly dilated outwards, 2 broad, oval as seen from above, concave, angulate and armed with a long, curved, slender, spiniform appendage at the inner apical angle (fig. 3), 3–10 gradually tapering; head foveate and canaliculate anteriorly, the epistoma tumid and angulate on each side in front; prothorax unidentate at the sides; anterior tarsi simple.

♀. Antennæ stout, tapering outwards, joint 2 long, thickened, subcylindrical; epistoma simple; prothorax as in ♂.

Hab. Philippines, Los Baños (*P. I. Baker*: ♀ ♂: No. 266).

One ♂ and 2 ♀ ♀ sent by Mr. Baker. The ♂ cephalic structure was not mentioned in Pic's "description abrégée." *L.* (*Intybia*) *guttatus*, Pasc., also has a lateral prothoracic tooth, but it is much smaller.

29 (*c*). *Laius alboplagiatus*, sp. n.

♂. Elongate, narrow, rather convex, slightly widened posteriorly, subopaque, finely pubescent; black, the anterior portion of the head and the antennæ (joints 6–10 excepted) testaceous, the elytra each with two rather large transverse whitish spots—one below the base, the other near the apex, neither reaching the suture, the anterior one extending to the outer margin,—the tarsal joints 1–4 flavous; densely, finely, the elytra rugulosely, punctate. Head subparallel at the sides before the eyes and then obliquely narrowed to the anterior margin, canaliculate; antennæ (figs. 10, 10 *a*) moderately long, joint 1 curved, stout, subtriangularly dilated at the apex externally, 2 very stout, long, narrow and hollowed at the base, produced into a sharp tooth at the inner basal angle, 3–10 gradually tapering. Prothorax longer than broad, transversely depressed before the base, the sides with a short median tooth. Elytra long. Legs rather short; anterior tarsi simple.

Length 2½ mm.

Hab. S.E. Borneo (*German Mission, ex coll. Fry*).

One male. Very like the Philippine *L. dentatithorax* and *L. subdentatus*; the head (♂) testaceous in front, subangulate at the sides before the eyes, and then obliquely narrowed to the apex; the second antennal joint differently shaped; the prothoracic tooth smaller than in *L. dentatithorax.*

The somewhat similarly-maculate *L. quadriguttatus*, Er., has the sides of the prothorax unarmed.

29 (*d*). *Laius semperi*, sp. n.

Elongate, narrow, widened posteriorly, rather convex, subopaque, finely pubescent; black, the antennæ (except the four or five outer joints and the basal one in part) testaceous, the elytra each with two large, transverse, somewhat rounded, whitish spots on the disc (one below the base, the other towards the apex), the legs (the tarsi in part excepted) piceous; the entire surface densely, finely, rugulosely punctate. Head rather convex anteriorly, obsoletely canaliculate; antennæ long, joint 1 curved, thickened towards the apex, 2 elongate, subcylindrical, stout, 3–10 gradually tapering, each longer than broad. Prothorax convex, longer than broad, transversely depressed before the base, the sides with a prominent median tooth. Elytra long, widest near the apex. Legs rather short.

♂. Antennæ (fig. 11) with joint 1 as in ♀, 2 oblique, moderately elongate, concave, scaphiform, toothed at the inner basal angle, 3–10 longer and more slender than in ♀; anterior tarsi simple.

Length 3 mm.

Hab. Philippines, Luzon (*Semper, ex coll. Fry*).

One pair, the ♂ immature. This is one of three closely allied Philippine forms with the sides of the prothorax more or less distinctly unidentate; it is separable from the two others by the narrower, oblique, scaphiform, second antennal joint in the ♂ (not unlike that of the same sex of the Bornean *L. tetrastictus*), and the smaller elytral spots.

29 (*e*). *Laius subdentatus*, sp. n.

♂. Elongate, narrow, rather convex, widened posteriorly, finely pubescent, opaque; black, the antennal joints 1–4 testaceous, the elytra each with two large, transverse, yellowish-white or flavescent spots—one ante-median, the other subapical, neither quite reaching the suture or outer margin; the entire surface densely, minutely, rugulosely punctate. Head triangular, finely canaliculate, the epistoma simple, the eyes prominent; antennæ (fig. 4) long, joint 1 triangularly dilated outwards, 2 enormously thickened, elongate-oval as seen from above, hollowed at the base and apex, bidentate within, 3–10 elongate. Prothorax elongate, feebly unidentate at the sides. Elytra moderately long. Legs short; anterior tarsi simple.

♀. Antennæ short, tapering outwards, joint 2 elongate, thickened, cylindrical.

Length $2\frac{4}{5}$–3 mm. (♂ ♀.)

Hab. Philippines, Butuan, Davao, and Kolambugan, in Mindanao (*Baker*: ♂ ♀: Nos. 6699, 16155, 16156), Bohol, Luzon (*Semper*: ♂ ♀).

Four ♂ ♂, five ♀ ♀. This species works out as near *L. diversenotatus*, from Banguey, in Pic's table (1910) of the opaque forms with two white spots on each elytron. There are numerous similarly-coloured Malayan insects, most of which are probably peculiar to a particular island.

29 (*f*). *Laius subcarinatus*, sp. n.

♀. Extremely like *L. subdentatus*, differing as follows: head with a fine median carina, the eyes less prominent; antennæ a little more slender, joints 1–3 only in part testaceous; prothorax less narrowed posteriorly, the lateral tooth just traceable; elytra more convex, and more widened posteriorly, the spots yellowish or white, the post-basal one strongly transverse, the subapical one large, rounded.

Length $2\frac{2}{3}$–$3\frac{1}{10}$ mm.

Hab. Palawan I. (*Baker*: type); Tenasserim, Tavoy (*Doherty*).

Three ♀ ♀, one sent under the same number as a ♀ *L. subdentatus*. This is one of three forms from Palawan found by Mr. Baker. It cannot be referred to either of the two species from that island named by Pic in 1910. The allied *L. inarmatus*, Pic (1917), and *L. carinaticeps*, Pic (1910), both from Java and both described from ♂ ♂, are said to have the head carinate, but the carina in the latter is lateral. The Tenasserim examples (two ♀ ♀) have the spots smaller and wholly white. The Sumatran *L. luteonotatus*, Pic (1921), must be an allied form

29 (*g*). *Laius tetrops*, sp. n.

♀. Very like *L. subdentatus*; the antennæ (the tip of joint

10 excepted) and legs (the bases of the femora excepted) testaceous, the elytra each with two very large, transversely subquadrate, yellowish spots; the head and prothorax somewhat shining, the former foveate in the middle and with the eyes less prominent, the prothorax less elongate, obsoletely unidentate laterally; the antennæ shorter, rapidly tapering outwards.

Length 2½ mm.

Hab. PALAWAN I. (*Baker*: No. 16154).

One ♀. The testaceous antennæ, tibiæ, and tarsi, and the very large transversely-subquadrate elytral spots, distinguish this insect from its numerous allies.

29 (*h*). *Laius waterstradti.*

? *Laius waterstradti*, Pic, L'Echange, xxv. p. 83 (♂) (1910).

♂. Elongate, widened posteriorly, opaque, black, the antennæ (the apical two joints excepted), head (the base excepted), and anterior legs in part, testaceous, the elytra each with two very large, yellowish-white spots—one near the suture, just below the base, subtriangular, the other on the disc before the apex, transverse. Head triangular, rather long, sulcate down the middle in front, the sides of the epistoma thus appearing tumid, the eyes prominent; antennæ (fig. 5) long, joint 1 broadly, quadrangularly dilated (as seen in profile), 2 enormously dilated, ear-shaped, concave within, and angularly produced, reflexed, and furnished with a slender, curved appendage at the inner basal angle, 3–10 rather slender. Prothorax about as long as broad, unarmed at the sides. Elytra rather elongate. Legs short; anterior tarsi simple.

Length 3 mm.

Hab. PALAWAN I., Puerto Princesa (*Baker*: No. 4284).

One male, possibly referable to *L. waterstradti*, Pic, the only tangible characters for which, as given in a comparative table of the spotted Malayan species, are the testaceous head and the enormously large, concave second (=third of Pic) antennal joint of the male. *L. palawanus*, Pic (*l. c.*), type ♀, is said to have the head distinctly raised in front above the antennæ and the elytra rather elongate.

29 (*i*). *Laius quadristrigatus*, sp. n.

♂. Elongate, widened posteriorly, opaque, finely pubescent, densely, minutely, rugulosely punctate; nigro-piceous, the head, joints 1 and 2 of the antennæ, prothorax, and anterior femora testaceous or rufo-testaceous, the elytra each with three large yellowish or yellowish-white spots—one on the disc below the base, transverse, the others elongate, subapical. Head triangular, barely as wide as the prothorax, flattened above anteriorly, the eyes moderately prominent; antennæ (fig. 6) long, joint 1 triangularly dilated, sharply dentate externally, 2 enormously developed, broad-oval as seen from above, concave, reflexed and angularly extended backward at the base above and there furnished with a long slender appendage. Prothorax a little broader than long, narrowed posteriorly, the sides rounded and strongly unidentate, the disc arcuately impressed before the base. Elytra moderately long, rather convex. Legs short; anterior tarsi simple.

♀. Antennæ stout, tapering outwards, joint 2 much thickened, elongate, subcylindrical; prothorax with the sides subangulate at about the middle, the tooth wanting.

Length $2\frac{9}{10}$–3 mm. (♂ ♀.)

Hab. PHILIPPINES, Baguio, Benguet (*Baker*: No. 6070).

One pair. A remarkably distinct form of the *Intybia*-section of the genus, and easily recognizable by the rufo-testaceous head and prothorax, and the two long yellowish streaks at the apex of each elytron, the prothorax dentate laterally in ♂.

29 (*j*). *Laius falcifer*, sp. n.

♂. Elongate, shining, clothed with fine scattered pubescence, intermixed on the elytra with long, erect, black, bristly hairs; black, the anterior portion of the head, joints 1–4 of the antennæ (the base of 1 excepted), prothorax, anterior legs, and intermediate tibiæ testaceous, the elytra nigro-violaceous, each with two large, transverse, whitish spots—one before the middle and the other subapical, neither reaching the suture or outer margin; the head and prothorax almost smooth, the elytra densely, finely, rugulosely punctate. Head a little narrower than the prothorax, transversely depressed in the middle between the eyes, the latter not very prominent; antennæ (fig. 7) moderately long, joint 1 curved, broadly dilated outwards, 2 enormously developed, somewhat ear-shaped, concave, foveate near the apex within, the reflexed inner margin very sharply, triangularly dilated at about the middle, and furnished with a long slender appendage near the base, 3–10 gradually tapering. Prothorax convex, uneven, about as long as broad, a little narrowed behind, the transverse basal depression deep. Elytra long, gradually widening to the apex. Legs long; anterior tarsal joints 1 and 2 thickened, 2 with a long, claw-like prolongation extending over 3 above, black at the tip.

♀. Antennal joint 2 very broad, simple, oblongo-quadrate; head and legs black.

Length 3½–4 mm. (♂ ♀.)

Hab. PHILIPPINES, Mt. Makiling, Luzon (*Baker*: No. 3035).

One pair. An elongate form, with a smooth, subquadrate, testaceous, shining prothorax and long, nigro-violaceous elytra, the latter each with two transverse white spots and the surface very finely punctured. It bears some resemblance to *L. birmanicus*, Champ., which has very different elytral markings and a longer prothorax. The long claw-like extension to the second joint of the anterior tarsi in the ♂ is a character foreign to all the species of *Laius* I have hitherto examined, but a ♂ of *L. tetrastictus* sent by Mr. Baker and two others from Perak also possess a very similar structure. *L. falcifer* must be nearly related to *L. adonis*, Pic (1921), from Sumatra.

29 (*k*) (29). *Laius tetrastictus.*

Laius tetrastictus, Champ. Ann. & Mag. Nat. Hist. (9) vii. p. 342 (♀) (April 1921).

♂. Antennal joint 1 moderately thickened outwards (as in ♀), 2 elongate, oblique, widened, concave, scaphiform, curved and pointed at the outer apical angle, and with the reflexed inner margin extending backward at the base and there furnished with a long, slender, curved appendage (fig. 8); anterior tarsal joint 2 extending over the base of 3 above.

Hab. N. AND W. BORNEO, Sandakan (*Baker*: ♂ ♀: No. 16158), Quop [type ♀ and ♂]; S.E. BORNEO (*German Mission, ex coll. Fry*: ♂ ♀).

A pair from Sandakan, the elytra marked as the Quop types (♂ ♀); three ♂ ♂ and four ♀ ♀ from the S.E. portion of the island.

29 (*l*). *Laius flavonotatus*, sp. n.

♂. Elongate, narrow, rather convex, widened posteriorly, finely pubescent, the head and prothorax moderately shining, the elytra subopaque; nigro-piceous, the anterior portion of the head, mouth-parts, the antennal joints 1, 2, and 10, the anterior legs (except the tarsal joints 2–5), the intermediate legs (except the apices of the tarsi), and the bases of the posterior tibiæ and tarsi, testaceous; the elytra each with three flavous spots—one, subtriangular, near the suture at the base, one, strongly transverse, at the middle (reaching the outer margin, but not extending to the suture), and one rounded, near the suture before the apex; densely, finely, the sides of the prothorax and the elytra rugulosely, punctate, the latter with intermixed slightly coarser punctures. Head triangular, compressed at the sides anteriorly, the central portion very narrow in front, hollowed in the middle between the eyes, the latter prominent; antennæ (fig. 12) moderately long, joint 1 curved, broad, angularly dilated near the base externally, 2 extremely large, oblong, irregularly excavate, and furnished at the base with a long, movable, rather broad, twisted appendage, 3–9 short. Prothorax convex, about as long as broad, narrowed posteriorly, and with the sides rounded anteriorly. Elytra moderately long, rounded at the sides beyond the middle. Legs rather short, not very slender; anterior tarsal joint 2 with a black claw-like extension reaching to the apex of 3 above.

Length 2⅘ mm.

Hab. Perak (*Doherty*).

One male. Near *L. tetrastictus*, and with similar anterior tarsi in ♂, the elytra each with three yellowish spots, the head much narrower in front and flavo-testaceous anteriorly, the antennæ (♂) very different, the legs partly testaceous, &c.

29 (*m*). *Laius erythrocephalus*, sp. n.

♂. Elongate, narrow, rather convex, widened posteriorly, finely pubescent, subopaque; nigro-piceous, the head, antennæ (the slightly infuscate outer joints excepted), and legs (the intermediate and posterior femora excepted) testaceous, the elytra with a rather narrow transverse fascia below the base (interrupted at the suture, but reaching the outer margin) and a transverse spot on the disc of each towards the apex, yellowish-white; the entire surface densely, finely, rugulosely punctate. Head triangular, flattened between the eyes and convex in front, obsoletely canaliculate; antennæ (fig. 13) long, joint 1 curved, moderately dilated, angulate near the base externally, 2 extremely large, broad, sublunate, deeply excavate within, and furnished with a long narrow appendage near the base above, 3–10 slender, elongate. Prothorax about as long as broad, narrowed and slightly sinuate at the sides towards the base. Elytra moderately long. Legs rather short, not very slender; anterior tarsal joint 2 raised above 3 and black at the tip.

Length 2⅘ mm.

Hab. PERAK (*Doherty*).

One male, slightly immature. Near *L. quadriguttatus*, Er., and *L. diversenotatus*, Pic, the head, and the legs and antennæ in great part, testaceous, the antennal joints 3–10 long and slender, the postbasal transverse whitish fascia on the elytra rather narrow and nearly reaching the suture, the legs a little longer. The present insect cannot be referred to either of the two forms named *L. dohertyi* by Pic in 1910 [' L'Echange,' xxvi. p. 62 (Aug.), type from Sumbava; *l. c.* p. 84 (Nov.), type from Perak]; the characters, however, given in his table of the 4-spotted species agree with the Perak insect before me, except as regards the shape of the elytral spots.

Additions to the numbered list of species of Laius.

*alboarcuatus, 6 (*a*).
*alboplagiatus, 29 (*c*).
dentatithorax, 29 (*b*).
*erythrocephalus, 29 (*m*).
*falcifer, 29 (*j*).
*flavonotatus, 29 (*l*).
*hexastigma, 26 (*a*).
pictus, 24.
quadriguttatus, 29 (*a*).
*quadristrigatus, 29 (*i*).
*rectefasciatus, 23 (*a*).
*semperi, 29 (*d*).
*subcarinatus, 29 (*f*).
*subdentatus, 29 (*e*).
*submarinus, 2 (*a*).
[tetrastictus, 29 (*k*) (20).]
*tetrops, 29 (*g*).
*variipes, 23 (*b*).
waterstradti, 29 (*h*).

Additional examples of the following species have also been detected in the Fry Collection:—

L. flavicornis, F. (No. 2). One ♂, Andaman Is.

L. malleifer, Champ. (No. 20). A pair from Yemen, Arabia (*Millingen*). Types from Punjab, and recently found (20. iii. 1921) by Dr. M. Cameron at Mossy Falls, Mussoorie.

L. birmanicus, Champ. (No. 23). Three ♂ ♂ and three ♀ ♀ taken at Carin Chebà, Karen Mts., Burma (*L. Fea*), are less elongate than the types, and the males have the second antennal joint a little narrower and less angulate. These specimens seem to come near *L. sikkimensis*, Pic (1914).

L. carinifrons, Pic (No. 30). Two ♂ ♂ found at Perak by Doherty.

XVIII.—*Two new Species of* Lycænidæ *from Madagascar.*
By Percy I. Lathy, F.E.S.

Lycænesthes mabillei, sp. n.

♂. Upperside: Both wings uniform lilac-blue with very fine dark margins, fringes whitish.

Underside: Both wings pale brownish grey as in *L. smithii*, Mab., but with the white markings more diffused; hind wing with minute crimson spot between veins 2 and 3, this spot edged with black and blue scaling; a similar but still smaller spot at anal angle.

Marsantsetia, N.E. Madagascar, 1 ♂.

The only species in the genus with which this can be confused is *L. smithii*, Mab., from which it may easily be distinguished by the wings above wanting the cupreous tint, and by the absence of the subbasal conspicuous blue-black spot of the hind wings below.

Azanus rubropuncta, sp. n.

♂. Upperside: Both wings dark lilac-blue with slight cupreous tint; narrow marginal dark border.

Underside: Fore wing pale grey; a whitish-edged dark grey spot at end of cell; two whitish bars beyond cell; submarginal area traversed by irregular whitish lines enclosing grey spots slightly darker than ground-colour. Hind wing pale grey clouded with whitish on discal area; a subbasal black spot, beyond this a row of four black spots; a black spot on costa beyond middle and another on inner margin; between these last two spots a series of dark grey markings crosses the wings beyond cell; a submarginal irregular dark grey line; three marginal dark grey spots between veins 4 and 7; a conspicuous marginal blue-centred black spot between veins 2 and 3, this spot inwardly edged with crimson; a small blue-centred black spot at anal angle.

Marsantsetia, N.E. Madagascar. A series of males.

May be easily separated from any other species in the genus by the crimson-edged black spot of underside of hind wing. The types of these two new species are in the collection of Madame Gaston Fournier.

XIX.—*On Two new Races of* Oryx.
By Lord Rothschild, F.R.S.

Oryx gazella blainei, subsp. n.

Differs from *O. g. gazella* in its paler and greyer ground-colour. There is also in the ground-colour an entire absence of the buffish or creamy suffusion present in *O. g. beisa*.

The black band running up from the throat to below and between the ears and base of horns is shorter, narrower, and more square-cut than in either *O. g. gazella* or *O. g. beisa*.

Black band from and below eye joined to face-blaze as in *O. g. gazella*.

Black of throat more restricted than in *O. g. gazella*. Ears much whiter than in either *O. g. gazella* or *O. g. beisa*.

Black stripe along centre of back as in *O. g. beisa*, but reaches further up hind neck and is continued as in *O. g. gazella* over the rump, expanding to root of tail, to which it is joined. Tail wholly black, with very large tuft as in *O. g. gazella*. Dark flank-band not joined to dark portion of thigh as in *O. g. gazella* nor so wide as in the latter. Dark colour on thigh much more restricted than in *O. g. gazella*, the whole front of lower part of thigh being white.

Black on rump less extended than in *O. g. gazella*.

Hab. Angola.

Type (♂, mounted), British Museum, Natural History, coll. Gilbert Blaine (presented Rowland Ward Trustees). (A mounted entire ♀, Tring Museum, coll. Gilbert Blaine).

Oryx gazella subcallotis, subsp. n.

Differs from *O. g. annectens*, Holl., in being intermediate between that form and *O. g. callotis* in colour and markings and in having ear-tufts or tassels, the latter, however, being smaller than in *O. g. callotis*.

Hab. Country between the ranges of *O. g. callotis* and *O. g. annectens*.

Type (mounted head), British Museum, Natural History (presented Rowland Ward Trustees). A second head from same source in the Tring Museum.

The discovery of these two new forms proves that *Oryx gazella* (Linn.) and *Oryx beisa* (Rüpp.) are only local forms of one species, so that the known forms of "gemsbok" must stand as follows:—

Oryx gazella gazella (Linn.). S. Africa.
—— —— *blainei*, Rothsch. Angola.
—— —— *beisa* (Rüpp.). Abyssinia.
—— —— *gallarum* (Neum.). S. Gallaland.
—— —— *annectens*, Holl. Brit. E. Africa.
—— —— *subcallotis*, Rothsch. S. Brit. E. Africa.
—— —— *callotis*, Thom. Tanganyika Prov.

In addition to these, I consider the Arabian *Oryx* only an extreme form of the same species, and it should stand as:—

Oryx gazella leucoryx (Pall.). Arabia.

XX.—*A new Neotreme Brachiopod from California.*

By S. Stillman Berry, Redlands, California.

[Plate XI.]

Among other unusual zoological material discovered by Mr. W. H. Golisch, of the South-west Museum, Los Angeles, in his investigation of corals and sponges hauled in by fishermen from deep water off the coast of Southern California, is a single specimen of a brachiopod, which seems to be not only new to science, but representative of a genus and family hitherto unreported from the west coast of North America.

For his kindness in immediately placing this interesting specimen at my disposal, I beg to tender Mr. Golisch appropriate acknowledgment, while I am further indebted to Messrs. Y. Hirase and J. T. Kuroda, of Kyoto, Japan, for the loan for comparative purposes of two young specimens of *Crania* (*Craniscus*) *japonica*, A. Adams, from the Hirase Collection.

Crania californica, sp. n. (Pl. XI.)

Description.—Shell strongly depressed, oblong in outline. Colour of exterior whitish; interior brownish white. Upper valve with apex low, situated approximately in the median line about one-third of the distance from the posterior margin; posterior outline rather straight; upper surface badly eroded, but, so far as can be seen, without evident radial striation; interior microscopically granulose, the margin flaring thinly beyond the heavy submarginal encircling ridge; pedestals of anterior adductor muscles strongly raised, far apart, and in no way coalescent, but connected by a low ridge, with a small, nipple-like prominence lying between and in front of them at nearly the centre of the valve; posterior adductor scars large, swollen, rounded-oval in outline, placed well inside the posterior angles of the shell; space between the four adductor scars roughly diamond-shaped, deep at the centre, and bounded by four almost coalescent curved ridges, the two anterior much more strongly inbowed than the two posterior; a pair of small rounded muscle-scars or pedestals are sheltered in the angle between the two anterior ridges and those connecting the anterior adductor pedestals with the median prominence previously described; anterior spaces conspicuously marked by seven or eight pallial (sinus?) impressions on each side.

Lower valve flattish, shallow, attached to the substratum by its entire lower surface, with the exception of a narrow, sharply ascending, marginal area; interior with a strong submarginal thickening, which shows numerous, obscure, fine, radial wrinkles down its inner slope.

Measurements.—Longitude 13·5 mm., diameter 16·2, height 4·4.

Type.—Cat. no. 4530, Berry Collection.

Type-locality.—From rock at base of a siliceous sponge taken in 100 fathoms off Santa Monica, Los Angeles County, California (*W. H. Golisch*), from fishermen, summer 1918; one specimen.

Remarks.—This fine *Crania* does not seem to be very closely allied to any of the previously described species of the group, unless it be the lately published *C. philippinensis* of Dall *, although I have had specimens of only three of the older species—*C. anomala* (Müller), *C. kermes* (Humphrey and Da Costa) †, and *C.* (*Craniscus*) *japonica*, A. Adams—available for direct comparison. The thickened and elevated edge of the lower valve, the posterior apex, and the number and conspicuousness of the pallial impressions are perhaps the most prominent of the peculiar features.

This is the first *Crania* to be reported either from California or elsewhere along the western shore of North America, the nearest records of this genus being those of *C. hawaiiensis*,

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* Proc. U.S. Nat. Mus. vol. lvii. p. 272.

† = *C. turbinata* (Deshayes), *teste* Davidson, Monog. Rec. Brach. p. 188.

Dall, from near Bird Island, in the mid-Pacific, and *C. patagonica*, Dall, from the coast of Chile and the Straits of Magellan. It was at first suspected that in view of the several species of brachiopods reported as common to the west coast of North America and Japan, *C. californica* and *C. japonica* might prove to be somewhat near akin, whereas in fact they seem to belong to different subgenera, or even genera. Mr. Hirase's specimens of the latter species were taken at Hirado, Province of Hizen, Japan.

The nomenclature pertaining to the rather complex topography of the interior of the valves in this group of brachiopods does not appear to be in very satisfactory condition in the literature, nor to be any too well correlated with that for the remainder of the animal's anatomy. Being in no position at the moment to initiate a serious attempt at a remedy, I have in this paper simply taken matters as I found them, and endeavoured to make the best of it.

Unfortunately some details, such as the central nipple-like prominence, are not brought out very plainly in the figures.

EXPLANATION OF PLATE XI.

Fig. 1. *Crania californica*, sp. n. Exterior of dorsal valve, × 3.
Fig. 2. Ditto. Interior of dorsal valve, with the dried animal *in situ*, × 3.
Fig. 3. Ditto. Interior of dorsal valve, after removal of the animal, × 3.

The figures are from photographs by Berton W. Crandall.

XXI.—*The "Huron" of the Argentine.*

By Oldfield Thomas.

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While working out the San Juan huron, *Grisonella*, referred to in a succeeding paper, I have come to the conclusion that my reference of the common huron of the Argentine to the Brazilian *Grisonella furax* cannot be sustained. When making it, material of the Argentine form was much less abundant than now, while, especially, I then supposed that a specimen in the Museum, no. 44. 3. 7. 6, labelled "Brazil, purchased of Clausen," was of too doubtful authenticity to be taken as of any value. But I now know that this specimen was one of a series collected in Minas Geraes (probably at Lagoa Santa) by Dr. M. Claussen, and may be treated as a genuine wild-killed example of *G. furax*. Being a fully adult male, it is of especial value for comparison with the Argentine examples available. This skull is 77 mm. in median length, a size which is exactly the same as that given by Winge for a Lagoa Santa skull in Copenhagen.

In comparison with this, it is evident that the materially larger animal from the Argentine should be distinguished. It may be called

Grisonella huronax, sp. n.

Size largest of genus. Colours as usual, the facial band in the type well marked, creamy-buff; light tipping of the dorsal hairs well developed. But there is great variation in both facial band and dorsal tipping, some examples being quite dark and with a nearly obsolete frontal band.

Skull stout and heavy, with well-developed crests and ridges. Teeth stout, molar comparatively large.

Dimensions of the type, male, and of an adult female from the same locality:—Head and body 600 mm., 510; tail (imperfect), 135; hind foot 70, 61.

Skull: median length 83, 73·5; condylo-basal length 84, 74; zygomatic breadth, 48, 42; interorbital breadth 20, 17·5; mastoid breadth 43·5, 37·5; maxillary tooth-row 24·8, 21; length of p^4 9·2, 7·4; transverse diameter of m^1 7·[illegible], 6.

Hab. Central and Eastern Argentina. Type from Mar del Plata, S.E. Buenos Ayres. Other specimens from various localities northwards to San Cristobal, Province of Santa Fé.

Type. Adult male. B.M. no. 12. 2. 17. 6. Original number 3. Collected 4th June, 1911, and presented by W. A. Smithers, Esq.

The larger Chilian huron, which in 1912 I described as *Grison furax melinus*, I should now consider as a distinct species, and its name should be *Grisonella melina*. In the comparison with the material then existing, too much stress was laid on the pallor of the facial line, which additional specimens show to be more strongly buff than in *G. huronax*, even if paler than in true *G. furax*. *G. melina* is a rather smaller animal than *G. huronax*, and is confined to the western side of the Andes.

XXII.—*On Mammals from the Province of San Juan, Western Argentina.* By OLDFIELD THOMAS.

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THE Museum has now received from Sr. E. Budin three small collections of Mammals from places in the Province of San Juan, and these may well be combined to form one general list.

The three localities are as follows:—

Cañada Honda, about 50 km. S. of San Juan City. Altitude about 500 m.

Pedernal, about 60 km. S.W. of San Juan, and 30 W. of Cañada Honda. Altitude about 1200 m.

Sierra Tontal, a north and south range of mountains some 60 km. W. of San Juan. Collection made at Los Sombreros, an estancia at about 2700 m. altitude, and 35 km. N.W. of Pedernal.

All three collections contained specimens of interest, but the Sierra Tontal proved much the richest locality, examples being obtained there of several mountain forms, such as *Lagidium* and *Abrocoma*, neither of which had been previously recorded from the province.

The present series forms the first contribution that the Museum has ever received from San Juan, and is therefore of proportionate value. Sr. Budin is much to be commended for the excellent collection he has made, and, as usual, for the admirable manner in which the skins are prepared.

A new huron and a second species of the recently described genus *Octomys* are the most notable discoveries made.

On the other hand, the almost complete absence of Muridæ is most remarkable, the family being only represented by *Phyllotis*, *Graomys*, and *Hesperomys*, and the two latter being very rare. Sr. Budin draws especial attention to the entire absence of *Akodon*, a genus whose members are generally the very commonest of the mammals in almost every other locality in South America, from Colombia to Cape Horn, their abundance in many places amounting to a plague.

1. *Felis salinarum*, Thos.

♀. 1255. Cañada Honda.

2. *Pseudalopex culpæus*, Mol.

♂. 1243, 1214. Cañada Honda.

3. *Grisonella ratellina*, sp. n.

♂. 1269. Pedernal, 1200 m.

Size markedly smaller than in *G. huronax*. Colour dark, iron-grey on fore-back, the light tipping of the hairs white, and only becoming slightly buffy on the rump and tail. Light facial band not strongly developed, whitish and less buffy than in other forms. Chin, interramia, and sides of throat with many white hairs intermixed with the black, but this may be an effect of senility, the only specimen being quite old.

Skull much smaller than in *G. huronax*, and also smaller than in the Chilian *G. melina*. Flattened above, the forehead decidedly lower than in the allied species. Ridges not greatly developed, in spite of the age of the type. Back of skull not broad, the mastoid breadth comparatively little.

Teeth much smaller than in *G. huronax*.

Dimensions of the type:—

Head and body 429 mm.; tail 169; hind foot 60; ear 22.

Skull: median length 77; condylo-basal length 77·5; zygomatic breadth 43; interorbital breadth 16·8; intertemporal breadth 17·3; mastoid breadth 37·7; height of crown above palate between m^1 18; maxillary tooth-row 22·5; length of p^4 8; transverse diameter of m^1 6·4.

Hab. As above.

Type. Old male, B.M. no. 21. 6. 19. 1. Original number 1269. Collected 9th January, 1921.

This huron is readily distinguished from the Argentine form, *G. huronax*, by its much smaller size and its more flattened skull. In this latter respect it resembles the Bolivian huron *G. luteola*, and may be nearly allied to it, but as *luteola* is only known from a female, and *ratellina* by a male, skull comparison is difficult. The colours of the two are, however, widely different, *luteola* being very strongly buffy, and alone equalled in that respect by the Brazilian *G. furax*.

4. *Conepatus proteus*, Thos.

♂. 1264; ♀. 1272, 1331. Pedernal, 1000–1200 m.

This little skunk was discovered in 1901 by P. O. Simons at Cruz del Eje, Cordova, and has since been obtained by W. Smithers at Dolores in the same province.

5. *Hesperomys murillus cordovensis*, Thos.

♂. 1253, 1256. Cañada Honda.

6. *Graomys* sp.

♂. 1254. Cañada Honda.
♀. 1268, 1333, 1334. Pedernal.
All more or less immature.

7. *Phyllotis darwini* subsp.

♂. 1271, 1321, 1326; ♀. 1267. Pedernal.
♂. 1285, 1297, 1304, 1319; ♀. 1290, 1292, 1295, 1298, 1310. Sierra Tontal.
Not or doubtfully distinguishable from *P. d. vaccarum* of Mendoza.

8. *Abrocoma schistacea*, sp. n.

♂. 1325, 1329; ♀. 1322, 1324. Pedernal.
♂. 1278, 1279, 1280, 1306, 1314; ♀. 1275, 1281, 1296, 1299, 1311. Sierra Tontal.
Several separate skulls.

Near *A. budini*, but with still larger bullæ.

Size about as in *budini*. General colour above pale slaty grey, with less of the drabby tone found in *budini*, in this respect more matching *famatina*. Under surface similar but paler, a well-marked whitish glandular patch on the chest, as usual. Tail fairly long, decidedly longer than in *cinerea*.

Skull very like that of *budini*, but with even larger bullæ, these being the largest found in the genus. Nasals long, not so attenuated behind as in *budini*. Mastoid islands on top of skull of medium size. Slenderness of muzzle, small incisors, and imperforate palate as in the other Argentine species. Molars unusually variable in size.

Dimensions of the type:—

Head and body 190 mm.; tail 111; hind foot 28; ear 26·5.

Skull: greatest length 49; condylo-incisive length 46·7; zygomatic breadth 24; nasals 18·5 × 5·5; interorbital breadth

6·2; greatest horizontal diameter of bulla 17·4; bi-meatal breadth 25·2; upper tooth-series 11·2.

Hab. as above. Type from Los Sombreros, Sierra Tontal. Alt. 2700 m.

Type. Adult female. B.M. no. 21. 6. 21. 11. Original number 1296. Collected 29th January, 1921.

Readily distinguishable from other species by its large bullæ.

[The following *Abrocoma*, obtained by Sr. Budin just across the border in the neighbouring province of Mendoza, may be conveniently described here:—

Abrocoma vaccarum, sp. n.

Colour as in *A. schistacea* and *famatina*. Size about as in *famatina*, but the ears decidedly larger and the tail shorter.

Skull slightly longer than that of *famatina*, shorter than in the other species. Muzzle slender, the nasals not peculiarly attenuated. Mastoid islands rather small. Bullæ smaller than in any of the other species. Molars fairly large.

Dimensions of the type:—

Head and body 191 mm.; tail 94; hind foot 28; ear 25.

Skull: greatest length 47; condylo-basal length 44·3; zygomatic breadth 24·2; nasals 18·5 × 5·4; interorbital breadth 6·8; greatest horizontal diameter of bulla 15; bi-meatal breadth 23·7; upper tooth-series 9·7.

Hab. North-western Mendoza; type from Punta de Vacas. Altitude 3000 m.

Type. Adult female. B.M. no. 21. 6. 24. 20. Original number 1364. Collected 12th March, 1921. Two specimens.

Distinguishable by the short tail and small bullæ. All these Argentine species of *Abrocoma* are nearly allied and very similar to each other, but the characters used, slight as they are, seem to be locally constant, while the respective mountain habitats are well separated and often completely isolated.]

9. *Octomys joannius*, sp. n.

♂. 1270; ♀. 1273, 1332. Pedernal, 1200 m.

Like *O. mimax* in all respects, cranial and external, except that the frontal region of the skull is quite materially broader, and flat or even slightly convex above instead of being concave in the interorbital space. In correlation with this the premaxillary processes are broader terminally, while the brain-case itself is somewhat more inflated.

In colour the resemblance is very close indeed, the only perceptible difference being that in *mimax* the flanks are more decidedly lighter than the back and the hips are whitish on their outer aspect, while in *joannius* both sides and hips partake of the general drabby tone. But the difference is so slight that no attention would have been paid to it had the skulls been identical.

Dimensions of the type:—

Head and body 167 mm.; tail 171; hind foot 35; ear 22·3.

Skull: greatest length 45; condylo-incisive length 41·6; zygomatic breadth 23; breadth of frontal premaxillary processes posteriorly 2·6 (in *mimax* 2·1); interorbital breadth 10·7; least breadth across brain-case 19; bimeatal breadth 22·2; diagonal length of bullæ 15·2; upper tooth-series (crowns) 8·5.

Type. Old female. B.M. no. 21. 6. 19. 12. Original number 1273. Collected 11th January, 1921.

It is of much interest to find a second locality for the remarkable genus *Octomys*, which was discovered by Sr. Budin at Tinagasta, Catamarca, in January 1920.

In spite of the considerable distance between the two habitats, the new form is remarkably like the older one, but the broader frontals suffice to distinguish the two.

"Very rare and very difficult to trap; unknown to the natives."—*E. B.*

10. *Ctenomys coludo johannis*, Thos.

♂. 1233, 1239, 1240, 1241, 1251; ♀. 1228, 1229, 1237, 1242. Cañada Honda.

Based on this series; No. 1233 the type.

I am now less sure than I was that this should be considered as a subspecies of *coludo*, but for the moment leave it under the name by which it was described.

11. *Ctenomys tulduco*, sp. n.

♂. 1328, 1330; ♀. 1327, 1335. Pedernal.

♂. 1277, 1283, 1286, 1315, 1317; ♀. 1282, 1287, 1289, 1291, 1308, 1318. Sierra Tontal.

Allied to *coludo*, but smaller and with shorter tail.

Size rather less than in *coludo*. General colour above drabby grey, not far from that of *johannis*, the tone not nearly so warm as that of *coludo*. But below the colour is also strongly drabby, the hairs broadly washed with dull buffy, about as in *coludo*, quite unlike the unusually light under surface of *johannis*. An inconspicuous dull nasal patch. Tail shorter than in *coludo*, the longest in the series 74 mm.; a line along its upper side black or blackish, varying in definition, but always more marked than in the allied species.

Skull not unlike that of *johannis*, but smaller and with rather smaller bullæ, though these are still far larger than in *mendocinus*.

Dimensions of the type:—

Head and body 190 mm.; tail 69; hind foot 32·6.

Skull: greatest length 45; condylo-incisive length 44·5; zygomatic breadth 27; nasals 16·5 × 7·4; interorbital breadth 9; least breadth across brain-case 17; bimeatal breadth 28·7; bulla 16 × 8·6; upper tooth-series (crowns) 8·7; oblique diameter of p^4 3·3.

Hab. as above. Type from Los Sombreros, Sierra Tontal. Alt. 2700 m.

Type. Adult male. B.M. no. 21. 6. 21. 18. Original number 1277. Collected 19th January, 1921.

This *Ctenomys* reflects in the darker colour of its under surface the more fertile character of its surroundings, as compared with the light-bellied *johannis*, found on the more arid and lower ground further east.

Sr. Budin says that instead of tuco-tuco the natives of San Juan have a special name for *Ctenomys*, "Tulduco," which may well be used as a specific term.

12. *Lagidium tontalis*, sp. n.

♂. 1274, 1309; ♀. 1294, 1303, 1316. Sierra Tontal, 2700 m. And several separate skulls.

Decidedly smaller than *L. famatinæ*, the geographically nearest of described species.

Size about as in *L. vulcani* of Jujuy. General colour (apart from the usual rusty or buffy patches due to hair-fading) pale grey, near "pale neutral grey," more mouse-grey on the sides. Shoulders and rump rather paler. A well-defined blackish dorsal line from withers to rump. Under surface broadly washed with yellow (near "chamois"). Inconspicuous white axillary patches present. Tail grizzled as usual, the end darker but not black.

Skull small, with slender muzzle. Nasals narrow, little inflated anteriorly, not visible from below outside the premaxillæ; behind the posterior border of the nasals is but little indented in the centre, and the premaxillæ surpass them by but a short distance. Interorbital space narrow, its anterior portion more definitely concave than usual. Mastoid islands on top of skull variable, generally rather small. Bullæ of medium size, smaller than in *famatinæ*, larger than in *vulcani*.

Dimensions of the type:—

Head and body 395 mm.; tail 340; hind foot 100; ear 83.

Skull: greatest length 91; condylo-incisive length 82; zygomatic breadth 46; nasals 33 × 10·5; interorbital breadth (not at notches) 19; diastoma 26; length of bulla 17; upper tooth-series (crowns) 19·4; breadth of p^4 4·7.

Hab. as above.

Type. Adult female. B.M. no. 21.6.21.39. Original number 1303. Collected 2nd February, 1921.

The series obtained is remarkably uniform in colour and skull-characters.

Readily distinguishable from *famatinæ* by its smaller size and more slender muzzle.

[The following *Lagidium* was obtained by Sr. Budin at Punta de Vacas, on the Transandean route in Mendoza, and may be here described:—

Lagidium viatorum, sp. n.

Size about as in *tontalis*; interorbital region broader.

General colour rather more uniform neutral grey, not lightened on shoulders and rump. Ends of hairs of lower surface distinctly ochraceous or cinnamon-buff, instead of the yellow of *L. tontalis*. White axillary patches present.

Skull of about the same length as in *tontalis*, but more bulky throughout. Nasals more inflated in their anterior halves, reaching backwards nearly as far as the premaxillæ. Interorbital region decidedly broader than in *tontalis*, its anterior part less decidedly concave. Bullæ about as in *tontalis*. Incisors of both adult specimens pale yellow in front. Molars comparatively large.

Dimensions of the type:—

Head and body 400 mm.; tail 335; hind foot 105; ear 80.

Skull: greatest length 91; condylo-incisive length 82; zygomatic breadth 48; nasals 34·5 × 11; interorbital breadth (notches excluded) 22; diastema 26·5; length of bulla 16·3; upper tooth-series (crowns) 20·3; breadth of p^4 5·2.

Hab. Punta de Vacas, N.W. Mendoza. Alt. 2300 m.

Type. Adult male. B.M. No. 21. 6. 24. 21. Original number 1336.

Three specimens, of which one is immature.

This vizcacha is no doubt nearly allied to *L. tontalis*, but is distinguished by the details above described, especially by its distinctly broader frontals.]

13. *Galea leucoblephara*, Burm.

♂. 1265. Pedernal.
♂. 1320. Sierra Tontal.

14. *Caviella australis joannia*, Thos.

♂. 1230, 1231, 1235, 1247; ♀. 1236, 1245, 1246, 1248. Cañada Honda.

♂. 1266. Pedernal.

♂. 1307, 1312, 1313; ♀. 1293, 1300, 1301, 1302, 1305. Sierra Tontal.

Based on the Cañada Honda series. No. 1246 the type.

15. *Dasypus vallerosus pannosus*, Thos.

♂. 1263; ♀. 1232, 1249, 1257. Cañada Honda.

XXIII.—*Two new Argentine Forms of Skunk.*

By Oldfield Thomas.

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Conepatus suffocans pampanus, subsp. n.

Most like *C. s. gibsoni*, as I now believe the Ajó skunk should be called, but the stripes conspicuously narrower, so as greatly to reduce the general amount of white on the animal. Stripes running down on to the sides of the base of the tail, as in *gibsoni*, while in *suffocans* this is very rarely the case. Fur of about the same texture as in *gibsoni*, not so soft as in *humboldti*. Tail bushy, broadly tasselled white-black-white, as in *gibsoni*, while *suffocans* rarely has the long white hairs at the end.

Skull as usual.

Dimensions of the type (measured on skin):—

Head and body (c.) 420 mm.; tail 280.

Skull: median length 71; condylo-basal length 67; zygomatic breadth 44; m^1, length 8, breadth 8·1 (both at right angles to axis of skull).

Hab. Western Buenos Ayres Province. Type from Bonifacio.

Type. Adult male. B.M. no. 17. 9. 15. 1. Collected July 1917, and presented by Cecil Porteous, Esq. Four specimens.

Mainly distinguishable by the reduction in the breadth and conspicuousness of the white dorsal stripes, these being nearly 2 inches broad in *gibsoni*, but only about half an inch in *pampanus*. There are now six specimens of *gibsoni* in the Museum and four of the present form.

Conepatus suffocans mendosus, subsp. n.

Size rather less than in other forms of *suffocans*.

Fur softer than in true *suffocans*, though not so soft as in *humboldti*. White stripes much reduced, one of the specimens having them almost absent, while in the other they are quite narrow and reach barely halfway down the back. Tail conspicuously short-haired, the hairs from half an inch to an inch shorter than in *suffocans*, those at the end barely attaining 35 mm.; the white at the bases of the hairs much reduced, so that scarcely any white can be seen in a general view of the tail, even on the underside. Owing to the comparative shortness of the hairs, the tail itself appears shorter than in *suffocans*, but the measurements show that the tail-body is of the usual length.

Skull of the usual proportions.

Dimensions of the type:—

Head and body 355 mm.; tail 205; hind foot 55; ear 22.

Skull: median length 69; condylo-basal length 65; zygomatic breadth 42; m^1, length 7·3, breadth 8·1 (at right angles to axis of skull).

Hab. Mendoza. Type from Tupungato, 1000 m. Another specimen from the Alvear Colony, San Rafael (*W. M. Bayne*).

Type. Adult male. B.M. no. 21. 7. 5. 3. Original number 1396. Collected 31st March, 1921, by E. Budin. Presented by Oldfield Thomas.

The much smaller *C. proteus* occurs between this and the true *C. suffocans suffocans*, the subspecies to which it appears most nearly allied.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 4th, 1921.—Mr. R. D. Oldham, F.R.S.,
President, in the Chair.

The following communications were read:—

1. 'An *Ottokaria*-like Plant from South Africa.' By Hugh Hamshaw Thomas, M.B.E., M.A., F.G.S.

The object of this note is to record the discovery in the Vereeniging Sandstones of the Transvaal of a fossil plant which bears considerable resemblance to the rare genus *Ottokaria*. Only two specimens of this type have hitherto been described—one from the Lower Gondwana of India, the other from beds of similar age in Brazil, and little or nothing is known about its nature or affinities. The present specimen agrees with the known examples in general size, and in having a more or less circular lamina (or head) seated upon a stalk; but it also possesses an additional feature in a thin flattened structure projecting beyond the head. This feature has been called the 'wing,' but its original nature is very problematical. It may have been formed from a platyspermic seed projecting from the head, the latter being a kind of cupule; or it may have been formed from a thin envelope originally enclosing the head.

Ottokaria was probably a reproductive structure, and its association with *Glossopteris* suggests a possible connexion with this plant, the reproductive structures of which are practically unknown. It is not considered necessary at present to make a new genus for this specimen, and the name of *Ottokaria lesliei* is assigned to it, after its discoverer Mr. T. N. Leslie, F.G.S.

2. 'On *Nummulospermum*, gen. nov., the probable Megasporangium of *Glossopteris*.' By A. B. Walkom, D.Sc.

The Author, after referring to the evidence hitherto adduced with regard to the nature of the spore-bearing organs of *Glossopteris*, describes some seeds associated with the fronds of *Glossopteris* at certain localities in Queensland. He refers the seeds to a new genus, and describes them under the name *Nummulospermum bowenense*. The seeds vary in length from 0 to 11 mm. and from 8 to 11 mm. in breadth; they are oval or circular, probably platyspermic, and possess a wide sarcotesta and narrow sclerotesta. The nucellus has a prominent beak projecting into a narrow micropyle The vascular system is also partly described. *Nummulospermum*, though closely associated with *Glossopteris* fronds, has not been found in actual connexion with them. Similar, and in some cases identical, seeds have been found in close association with *Glossopteris* at other localities.

Remarks are added on the scale-leaves of *Glossopteris*, and on the affinities of *Glossopteris*, which the Author is disposed to include in the Cycadofilicales. He is of opinion that the anatomical features of the seeds, so far as they can be made out from the impressions, favour their inclusion in the Trigonocarpales.

3. 'The Evolution of Certain Liassic Gastropods, with special reference to their Use in Stratigraphy.' By Miss Agnes Irene McDonald, B.Sc., and Arthur Elijah Trueman, D.Sc., F.G.S.

The gastropods dealt with in this paper are turriculate forms, which have generally been called

(a) *Cerithium*, which includes those Liassic species that are ornamented with axial and spiral threads, forming a network, often with tubercles; now referred to the family Procerithidæ, Cossmann.

(b) *Chemnitzia*, which includes species ornamented by strong axial ribs; now referred to the family Loxonematidæ, Koken.

An endeavour has been made to study these gastropods in the light of modern palæontological research, and suggestions for their classification, based on ontogenetic and other evidence, are made. The position and characters of the ornamentation have proved of value in classification, when taken in conjunction with the other characters of the shell.

Many of the biological principles that have been studied in such groups as the Ammonites are clearly illustrated by these gastropods. In numerous series, acceleration and retardation of development is indicated. Examples of homœomorphy of several types have been noted; the recognition of such homœomorphs, which often occur at different horizons, is essential in the identification of species in these groups, if they are to be of value in correlation.

The Procerithidæ of the Lower Lias are chiefly species of *Procerithium*, in which the flattish whorls have reticulate ornament based on three spirals; this central stock is also common in the Inferior Oolite, where it is represented by similar species with four spirals (*Cerithium muricatum*). This series probably gave rise to many recent Cerithidæ which have more than four spirals. Besides the species with three spirals, there are in the Lias many forms which the Authors regard as more specialized, and are characteristic of particular horizons. Other genera of Procerithidæ are recognized, of which *Cerithinella* and *Paracerithium* have distinctive ornament. The pupoid forms which have been grouped in the genus *Exelissa* are regarded by the Authors as catagenetic descendants of diverse species of *Procerithium*.

The Loxonematidæ of the British Lias are of two types—one with axial ornament only (*Zygopleura*), the other with axials and feeble spirals (*Katosira*). Each of these genera during the Lias evinces a tendency to increase the number and curve of the axials. In development, axials always appear before spirals among the Loxonematidæ, while spirals are developed first among the Procerithidæ.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 45. SEPTEMBER 1921.

XXIV.—*Exotic* Muscaridæ (*Diptera*).—III.*

By J. R. MALLOCH, Urbana, Ill., U.S.A.

AFRICAN SPECIES.

Subfamily PHAONIINÆ.

Genus TRUPHEOPYGUS, nov.

Generic characters.—Similar to *Helina*, R.-D. Differs from that genus in having the frons about one-third of the head-width; the abdomen subcylindrical, slightly tapered apically, the genitalia entirely concealed when the abdomen is viewed from the side or above; the fifth sternite deeply cleft in centre; hind tibia with one or more postero-dorsal bristles at middle; prescutellar acrostichals absent; scutellum flattened above; preapical scutellars absent.

Genotype, the following species.

Trupheopygus testaceus, sp. n.

Male.—Pale testaceous yellow. Frons brown; antennæ fuscous. Thoracic dorsum with four pale brown vittæ anteriorly, and a patch of grey pruinescence between the dorsocentrals posteriorly which extends to disc of scutellum. Abdomen with an indistinct pair of brown spots on second tergite, and an even less distinct pair on third. Tarsi fuscous. Cross-veins narrowly brown.

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* For Part I., see Ann. & Mag. Nat. Hist. (9) vii., Feb. 1921, pp. 161-178; Part II., *ibid.*, May 1921, pp. 420-431.

Each orbit with four or five long bristles ; ocellar bristles very long ; arista long-haired. Presutural acrostichals absent ; postsutural dorso-centrals 3 ; both intra-alars long ; prealar absent ; sternopleurals 1 : 1 : 1 ; hypopleura bare. First and second tergites each with a long bristle on side, third and fourth with long bristles on posterior margins, and the fourth with a median series ; basal portion of hypopygium with some bristles ; fifth sternite with two bristles on each side at base of incision. Fore tibia with one antero-dorsal and one posterior bristle ; mid-tibia with one antero-dorsal and two postero-dorsal bristles ; hind femur with some short, widely placed bristles on antero-ventral surface, and one long one before apex ; hind tibia with one or two antero-ventral, two antero-dorsal, and one strong postero-dorsal median bristle. Costal thorn long ; veins 3 and 4 parallel apically. Lower calyptra not very large.

Length 6 mm.

Type, Embu, Kenya Colony, 20. ii. 1914 (*G. St. Orde Browne*).

Genus SPILARIA, S. & D.

This genus is distinguished from its nearest allies by th possession of the following characters :—Hypopleura with vertical series of fine hairs below the metathoracic spiracle : both intra-alar bristles strong, the anterior one in line with or almost in line with the anterior dorso-central bristle eyes distinctly hairy, generally conspicuously so.

All these characters apply also to another genus, *Eusp laria*, gen. nov., which may be differentiated from *Spilaria* follows :—

Hypopygium of male small, not prominent, generally almost concealed, the fifth sternite not deeply cleft, basal sternite generally with some hairs ; præscutellar acrostichals present ; scutellum in both sexes with the hairs continued down over sides and sometimes invading the ventral surface ; parafacials bare in both sexes ...... *Spilaria*, S. & D.

Hypopygium of male large, prominently exposed, the fifth sternite deeply cleft, basal sternite bare ; prescutellar acrostichals absent ; scutellum in both sexes with the hairs continued down over sides and sometimes invading ventral surface ; parafacials in female with some setulose hairs in a series which is continued below apex of second segment .... *Euspilaria*, gen. no

Key to Species of Spilaria.

1.	Third antennal segment about four times as long as second	2.
	Third antennal segment not over 2·5 as long as second	3.
2.	Palpi yellow; both cross-veins of wings conspicuously infuscated, the outer one nearly straight; tibiæ entirely pale	*punctifer*, Malloch.
	Palpi black; cross-veins of wings very indistinctly infuscated, the outer one distinctly bent in middle; tibiæ infuscated at bases	*africana*, sp. n.
3.	Outer cross-vein of wing distinctly, but not conspicuously, bent in middle, evenly infuscated throughout; margin of upper calyptra pale; scutellum not pale below at apex; palpi black	*mollis*, Stein.
	Outer cross-vein of wing almost S-shaped, with a punctiform black mark at each extremity; margin of upper calyptra fuscous; scutellum yellowish below at apex; palpi black	*trinubilifera*, sp. n.

Spilaria mollis (Stein).

Spilogaster mollis, Stein, Berl. ent. Zeitschr. li. p. 55 (1906).
Mydæa hirticeps, Stein, Ann. Mus. Nat. Hung. xi. p. 486 (1913).

I have before me specimens of this species from Estcourt (8), Ulundi (1), and Durban (1), Natal, and Pretoria (1).

Spilaria punctifer, Malloch.

I have seen two specimens of this species, in addition to the type. One from Chirinda, Southern Rhodesia, and the other from Angola, Benguella.

Spilaria africana, sp. n.

Female.—Similar in colour to *punctifer*, Malloch. Differs in having the cross-veins of the wings very inconspicuously darkened, the palpi black, and the bases of the tibiæ slightly infuscated.

The fore tibia has only one posterior median bristle, and the outer cross-vein is distinctly, but not conspicuously, bent in middle. Otherwise as *punctifer*.

Length 7·5 mm.

Type, Mt. Mlanje, Nyasaland, 23. viii. 1913 (*S. A. Neave*).

One specimen in poor condition.

Spilaria trinubilifera, sp. n.

Female.—Darker than *punctifer*, with a slight bluish-grey tinge. The head is entirely black, the tibia are blackened at bases, the extreme tips of femora are blackened, and the infuscation on outer cross-vein is in the form of two spots, one at each extremity of the vein.

The third antennal segment is about 2·5 times as long as second, and the outer cross-vein is very conspicuously curved, almost S-shaped.

Length 7–7·5 mm.

Type, Kijabe, Kenya Colony, in bamboo forest 7000–8000 feet (*W. J. Radford*). Paratype, Mau Forest, Kenya Colony, 8000 feet (*H. A. Bodeker*).

Genus EUSPILARIA, nov.

In addition to the characters listed on a preceding page for the differentiation of this genus, it may be pertinent to state that the abdomen of the male is more slender than that of any species of *Spilaria* known to me, and the parafacials wider.

Genotype, the following species.

Euspilaria fuscorufa, sp. n.

Male and female.—Black, shining, with dense dark gre pruinescence. Head entirely black. Thorax broadly rufou, on sides of dorsum and on at least the upper half of pleur and the margins of scutellum, the disc of mesonotu fuscous, quadrivittate. Abdomen without distinct markings. Legs in female rufous; tips of femora and all tarsi black; the tibiæ slightly infuscated; in male the femora are more extensively blackened, the fore pair almost entirely so, and the tibiæ are much darker. Wings clear, both cross-veins conspicuously blackened, the outer one with two separated spots, one at each extremity. Calyptræ and halteres yellowish.

Male.—Eyes densely haired; narrowest part of frons a little wider than distance across posterior ocelli; orbits bristled to middle; parafacial at base of antennæ wider than third antennal segment, narrowed below; face concave in profile; arista long plumose. Thorax without strong presutural acrostichals, with three pairs of postsutural dorsocentrals, and the sternopleurals 2 : 2; prealar bristle very short; hypopleura with the usual hairs below spiracle. Abdomen narrow, subcylindrical; upper hypopygial forceps rather long, acute at apex; basal sternite bare; fifth sternite with a deep V-shaped incision. Fore tibia with a long fine median posterior bristle; fore tarsus longer than tibia; mid-femur with a series of long bristles on postero-ventral surface; mid-tibia with four long posterior bristles; hind femur with long bristles on apical half of antero-ventral surface, the series duplicated in part; postero-ventral surface bare; hind tibia with some long bristles on apical half of antero-ventral and antero-dorsal surfaces, some of them invading the anterior surface. Outer cross-vein almost S-shaped; veins 3 and 4 divergent at apices.

Female.—Frons less than one-third of the head-width at vertex, widened anteriorly; a series of setulæ descending on parafacial below apex of second antennal segment. Legs with stouter and shorter bristles than in male, the hind tibia with one antero-ventral and two antero-dorsal bristles.

Length 7–8 mm.

Type, male, and allotype, north of Mt. Kenia, 18. ii. 1911, 8300 feet. Paratype, male, west of Mt. Kenia, 19–20. ii. 1911, 6500–7250 feet (*T. J. Anderson*).

The African species *Mydæa nemoralis*, Stein, probably belongs to the genus *Spilaria*, and may be separated from the species listed in this paper by its having four pairs of postsutural dorso-ventral bristles, and the cross-veins not noticeably infuscated. Stein has placed his species as a synonym of *mulcata*, Giglio-Tos, a Mexican species, but I am inclined to doubt this. I have not seen *nemoralis*, Stein.

Genus Idiopygus, nov.

Generic characters.—Similar to *Helina*, R.-D. Differs in having the superior and inferior hypopygial forceps of male long and slender, and the fifth sternite very deeply cleft in middle of posterior margin, giving it the appearance of having two long latero-posterior processes, the general habitus of the hypopygium similar to that of some species of *Cœnosia* and *Pygophora*. The fourth visible tergite of female is not chitinised and transverse at apex, but depressed and somewhat membranous, sometimes notched in centre of posterior margin. The anterior intra-alar bristle is absent or distinctly caudad of the anterior postsutural dorso-central. Hypopleura either bare or with some minute hairs in centre; scutellum always bare on sides and ventrally; hind tibia in female with two or three short postero-dorsal bristles.

Genotype, *Spilogaster hirtipes*, Macquart.

Key to Species.

1. Males .... 2.
   Females .... 5.
2. Hind tibia remarkably dilated as in some species of bees; fore tibia with remarkably long strong hairs ventrally; mesosternum with a long stout process which is directed downward and armed at apex with a dense clump of black backwardly directed bristles. *hirtipes*, Macquart.
   Hind tibia normal, not noticeably dilated; mesosternum but little produced downward. 3.
3. Hypopleura bare; fore and hind tibiæ rather densely long-haired ventrally; anterior intra-alar bristle absent; eyes separated by at least one-third of the head-width; each orbit with five equally long, strong bristles which are equally spaced........ *villipes*, sp. n.
   Hypopleura with a few very short hairs in middle below spiracle; fore and hind tibiæ with very short hairs; anterior intra-alar present; eyes separated by about one-fifth of the head-width; each orbit with a wide space at centre without bristles .... 4.
4. Hind trochanters with very fine hairs ...... *hirtiventris*, sp. n.
   Hind trochanters with dense, short, stout, rectangularly bent bristles.............. *trochanteratus*, sp. n.
5. Legs largely reddish yellow; fourth tergite but little depressed at apex in centre; fore tibia with one posterior and two antero-dorsal bristles .... *hirtipes*, Macquart.
   Legs entirely black; fourth abdominal tergite very noticeably depressed in centre at apex. 6.
6. Anterior intra-alar bristle absent; fore tibia with one posterior and two antero-dorsal bristles .... *villipes*, sp. n., or [*trimaculata*, Stein.
   Anterior intra-alar bristle present, fore tibia with two antero-dorsal bristles, the posterior bristle absent .... *hirtiventris*, sp. n.

Idiopygus hirtipes (Macquart).

Spilogaster hirtipes, Macquart, Dipt. exot., Suppl. 1, p. 202 (1846).

I give a description of this remarkable species, as the original is very short and deals only with the male. The legs are stated by Macquart to be entirely black, but they are not so in the specimens before me.

Male and female.—Black, subopaque, densely grey pruinescent. Head entirely black. Thorax with four brown vittæ anteriorly and a central one posteriorly, the latter extending over disc of scutellum. Abdomen with a pair of fuscous spots on each tergite from 1 to 4 inclusive, those on 2 and 3 much larger than the others; apices of processes of fifth sternite yellowish, glossy. Legs black, basal two-thirds of mid and hind femora and the extreme knee-joints in male reddish yellow; the mid and hind femora, except at apices above, base of fore tibia, and nearly all of mid and hind pairs reddish yellow in female. Wings clear, three conspicuous black spots on disc, one on inner cross-vein, and one on each extremity of outer cross-vein. Calyptræ and halteres yellowish.

Male.—Narrowest part of frons about twice as wide as distance across posterior ocelli; three bristles on anterior third of each orbit; arista plumose. Thorax with three pairs of postsutural dorso-central bristles; anterior intra-alar present; sternopleurals 1 : 2. Abdomen subcylindrical, fourth tergite with strong bristles at apex and middle; fifth very short, bare in centre; sixth very long, bulbous, with many setulæ; superior and inferior forceps very long, the superior pair slender, the inferior pair dilated apically; third and fourth sternites very short and broad, processes of fifth very long, tapered to a point, directed slightly downward at apex. Bristles at apex of processes of mesosternum flexed at apices. Fore femur with strong bristles on entire surface postero-ventrally; fore tibia with remarkably long dense bristly hairs on entire length of postero-ventral and ventral surfaces; mid-tibia with two posterior bristles; basal segment of mid-tarsus dilated at apex and armed with a tuft of dense brown hairs at tip, the posterior surface with some long setulose hairs; hind femur with an entire series of long bristles on antero-ventral surface; a group of short erect bristles at base on posterior surface, two erect bristles which are closely placed at middle, and a comb-like series of about thirteen short bristles at apex on postero-ventral surface; hind tibia very conspicuously dilated at or slightly beyond middle, the dilated portion compressed, furnished with rather dense hairs on anterior surface, and with a few short bristles, the apex slightly produced and with two long bristles under tip; anterior surface of basal segment of hind tarsus with some long setulose hairs. Outer cross-vein slightly curved.

Female.—Frons over one-third of the head-width; each orbit with four bristles, the upper two directed backward. Fourth tergite without bristles at apex, the tip but little depressed in centre. Hind tibia with one antero-ventral, two antero-dorsal, and two postero-dorsal bristles.

Length 6·5–7·5 mm.

Six males, Ngare Narok, Masai Reserve, Kenya Colony, 31. xiii. 1913, about 6000 feet (*Capt. A. O. Luckman*); one female, west of Mt. Kenia, 19, 20. ii. 1911, 6500–7250 feet (*T. J. Anderson*); one female, North Nyasa, 30. viii. 1909 (*Dr. J. B. Davey*).

Idiopygus villipes, sp. n.

Male.—Black, marked as *hirtipes*. The legs entirely blackish.

Differs from *hirtipes* in having the eyes separated by over one-third of the head-width and the orbits, as stated in the key. The intra-alar bristle is absent. Fore femur with long fine hairs at base of postero-ventral and on ventral surface, and some long bristles on apical half of postero-ventral surface; fore tibia with the ventral hairs much longer than the tibial diameter, no posterior median bristle present; mid-legs missing; hind femur thickened, with long fine hairs ventrally and some long bristles on apical half of antero-ventral surface; hind tibia not dilated, slightly produced at apex ventrally, with numerous fine hairs as on fore tibia, and two antero-dorsal and two postero-dorsal bristles.

Length 7·5 mm.

Type, Lagari, Kenya Colony, 1. iii.–21. v. 1900 (*C. S. Betton*).

A female which is either that of this species or *trimaculata*, Stein, has the thoracic characters of this species. The mesosternum is carried downward more pronouncedly than in the male of *villipes*, a character which would indicate a greater protuberance in the male of the species to which it belongs, which leads me to believe that it is *trimaculata*. The specimen was taken on Mt. Mlanje, Nyasaland, 27. xi. 1912 (*S. A. Neave*).

Idiopygus hirtiventris, sp. n.

Male and female.—Black, marked as in the two preceding species, but the median vitta on mesonotum is not continued on to disc of scutellum. Legs entirely black.

Male.—Frons as in *hirtipes*, but with a long bristle on each orbit in line with anterior ocellus. Anterior intra-alar strong. Abdomen cylindrical, fourth visible tergite depressed in centre at apex, fifth almost concealed, sixth almost as long as fourth, setulose; sternites with long, rather dense hairs, the processes of fifth rounded at apices, densely long-haired on their entire length. Fore femur with long bristles on entire length of postero-ventral surface; fore tibia without conspicuous hairs, antero-dorsal surface with two short bristles, the posterior bristle absent; mesosternum slightly produced downwardly and armed at apices with a dense brush or tuft of stiff black bristles which are curved caudad; mid-legs missing; hind femur stout, with long hairs ventrally and some stout bristles on apical half of antero-ventral surface, the postero-ventral surface with one or two bristles beyond middle; hind tibia slender, produced into a blunt process at tip ventrally, antero-dorsal surface with two bristles, postero-dorsal surface bare.

Female.—Differs from the male in having the hind tibia simple at apex, and the postero-dorsal surface with three short bristles. The fourth tergite is more conspicuously depressed at apex than in the other species, presenting the appearance of having a Y-shaped slit in centre of posterior margin.

Length 5–6 mm.

Type, male, allotype, and one female paratype, Mt. Mlanje, Nyasaland, 14. xi. 1913, 6500 feet (*S. A. Neave*).

Idiopygus trochanteratus, sp. n.

Male.—Similar to the preceding species. Differs in having the spots on dorsum of abdomen very small, only the pairs on tergites 2 and 3 and the one in centre of sixth distinct.

The abdomen has fewer and shorter hairs on the sternites than in *hirtiventris*, and the hind trochanters are armed with a dense tuft of short stout bristles, the apices of which are flexed backwardly, whereas in the preceding species there are only fine hairs present. The mid-femur has fine bristles on basal half of the ventral and antero-ventral surfaces, which increase very much in length from base apicad. In other respects as *hirtiventris*.

Length 6·5 mm.

Type, Ulundi, Natal, ix. 1896, 5000–6500 feet (*G. A. K. Marshall*).

In addition to the species listed herein, *Mydæa mirabilis*, Stein, evidently belongs to this genus.

Subfamily *Cœnosiinæ.*

Genus Brevicosta, nov.

Generic characters.—Closely resembles *Cœnosia*, Meigen. Differs in having the arista moderately long-haired, ocellar bristles not longer than the postvertical pair; fore tibia unarmed at middle, mid-tibia unarmed at middle on anterior surface, hind tibia with two antero-dorsal and two postero-dorsal bristles, and the costal vein not extending beyond apex of third vein and with short black setulæ to beyond apex of second vein.

Genotype, the following species.

Brevicosta africana, sp. n.

Female.—Head black, densely whitish pruinescent, the interfrontalia, when seen from in front, less densely pruinescent than orbits and frontal triangle; antennæ yellowish, second segment largely brown; palpi yellowish, infuscated apically. Thorax black, densely grey pruinescent, not distinctly vittate, but darker along the lines of dorsocentrals. Abdomen black, densely grey pruinescent, with three black spots on each tergite, the median spots forming an almost complete vitta; apices of tergites 2 to 4 narrowly, of 5 broadly yellowish. Legs entirely yellowish. Wings clear. Calyptræ brownish yellow. Halteres yellow.

Frons at vertex less than one-fourth of the head-width, widened anteriorly; frontal triangle narrow, extending to anterior margin of frons; arista with its longest hairs about as long as width of third antennal segment, the latter extending about two-thirds of the way to mouth-margin. Acrostichals in two series; dorso-centrals 1 : 3; lower stigmatal bristle minute or absent. Mid-tibia with one posterior bristle; hind tibia with one antero-ventral, two antero-dorsal, and two postero-dorsal bristles, the apical one of the two antero-dorsal bristles very long. Veins 3 and 4 divergent apically. Lower calyptra little larger than upper.

Length 3 mm.

Type, Zungeru, Northern Nigeria, xi. 1910 (*Dr. J. W. Scott-Macfie*).

ASIATIC SPECIES.

Subfamily *PHAONIINÆ*.

Phaonia atronitens, sp. n.

Male.—Black, shining. Frons, orbits, face, and cheeks with white pruinescence. Thorax indistinctly vittate, the dorsum with faint greyish pruinescence. Abdomen slightly greyish pruinescent, with a black dorso-central vitta which is slightly dilated at apex of each tergite. Legs black. Wings clear, veins fuscous, paler basally. Calyptræ white. Halteres fuscous.

Eyes densely long-haired; narrowest part of frons a little wider than distance across posterior ocelli; orbits with long fine bristles almost to anterior ocellus; interfrontalia distinct on its entire length; third antennal segment at least three times as long as second, its apex extending almost to mouth; arista with its longest hairs nearly as long as width of third antennal segment; parafacial not as wide at base of antennæ as width of third antennal segment, narrowed below; cheek as high as width of third antennal segment; palpi slender; proboscis stout and short. Thorax with three or four pairs of very fine, long presutural acrostichal bristles; prealar absent; postsutural dorso-centrals 3. Abdomen narrowly ovate; hypopygium small, concealed; fifth sternite with a broad rounded posterior emargination; each sternite, including fifth, with a long fine bristle at each side apically. Fore tibia unarmed at middle; fore tarsus slender, much longer than tibia; mid-tibia with two or three postero-dorsal bristles; hind femur with a series of fine bristles on antero-ventral surface, and some shorter bristles on basal half of postero-ventral; hind tibia with two antero-dorsal and three or four antero-ventral bristles, the calcar short. Costal thorn small; veins 3 and 4 divergent apically.

Female.—Differs from the male in having the eyes very short-haired, and the frons over one-third of the head-width.

Length 5–6 mm.

Type, male, allotype, and four male paratypes, Gulmarg, Kashmir, 1913, 8500 feet (*F. W. Thomson*).

Pogonomyia fumipennis, sp. n.

Male.—Black, shining. Head with whitish pruinescence on parafacials and face. Thorax not vittate, with slight brownish pruinescence. Abdomen with brownish-grey pruinescence on sides of each tergite. Legs black. Wings infuscated, most noticeably so at bases. Calyptræ white. Halteres black.

Eyes separated by a little less than width across posterior ocelli; orbits setulose almost to anterior ocellus; parafacial as wide as third antennal segment; mouth-margin produced; cheek rather densely setulose below, the upwardly curved bristles moderately numerous; longest hairs on arista distinctly longer than its basal diameter. Thorax with three pairs of postsutural dorso-central bristles; prealar very long. Abdomen elongate, narrow, almost parallel-sided, and slightly depressed; hypopygium small. Fore tibia with one posterior and two or three postero-ventral bristles; fore tarsus slender, much longer than tibia; mid-femur on both antero-ventral and postero-ventral surfaces with long fine bristles almost to apex; mid-tibia with three or four postero-dorsal and postero-ventral bristles; hind femur slender, with a series of long bristles on entire antero-ventral surface, the postero-ventral surface bare except near base; hind tibia slightly produced at apex ventrally, with a short curved bristle near tip of produced part, the anterior and antero-ventral surfaces with rather dense setulose hairs, some of which are stronger than others, the postero-dorsal surface with three or four long bristles. Wings larger than in most species of the genus.

Length 5–6 mm.

Type and three paratypes, Gulmarg, Kashmir, 1913, 8500 feet (*F. W. Thomson*).

This species has the same habitus as *P. tetra*, Meigen.

Subfamily Anthomyiinæ.

Pegomyia atroapicata, sp. n.

Male.—Black, slightly shining, densely grey pruinescent. Head, including antennæ and palpi black, orbits, face, and cheeks with silvery pruinescence. Thorax indistinctly vittate, the lateral margins whitish pruinescent. Abdomen with a black dorso-ventral vitta, and, when seen from the side, lateral blackish checkerings. Legs yellow, fore femora, apices of mid and hind femora, and all tarsi black, bases of mid-tibiæ slightly infuscated. Wings clear. Calyptræ white. Halteres yellow.

Eyes almost contiguous below anterior ocellus; interfrontalia obliterated on upper half; orbits setulose on lower half; arista pubescent; cheeks very narrow, with strong marginal bristles. Thorax with three pairs of short presutural acrostichals; prealar very long. Abdomen subcylindrical; hypopygium small; processes of fifth sternite of moderate length, almost bare on basal half, with a few strong bristles apically. Fore tibia with one antero-dorsal and two posterior bristles; mid-femur with one bristle at base on ventral surface; mid-tibia with one antero-dorsal and four irregularly arranged posterior bristles; hind femur with an antero-ventral series of sparse bristles and two or three bristles on basal half of postero-ventral surface; hind tibia with two postero-dorsal, one antero-ventral, and three antero-dorsal bristles, and an extra bristle on posterior surface basad of middle. Veins 3 and 4 subparallel apically. Calyptræ subequal.

Female.—Frons about one-third of the head-width, lower supra-orbital bristle directed forward; cruciate bristles absent.

Length 7 mm.

Type, male, allotype, and one male and one female paratype, Gulmarg, Kashmir, 1913, 8500 feet (*F. W. Thomson*).

This species differs from its allies in the colour of the
gs and in having an extra bristle on the posterior surface
the hind tibia.

AUSTRALASIAN SPECIES.

Subfamily *PHAONIINÆ.*

Myiospila flavicans, sp. n.

Female.—Testaceous yellow, slightly shining. Head
scous, orbits, face, and cheeks with white pruinescence;
lpi fuscous; antennæ yellow, second segment darker.
ioracic dorsum with four reddish vittæ, the intervening
aces yellowish pruinescent. Dorsum of abdomen with very faint traces of a pair of spots on tergites 2 and 3. Tarsi barely darker than tibiæ. Wings clear, veins yellow, darker apically. Calyptræ and halteres yellow.

Eyes with microscopic hairs; frons at vertex about one-fifth of the head-width, nearly twice as wide anteriorly; interfrontalia with a pair of weak cruciate bristles; anterior orbital bristle much stronger than the others; arista long plumose. Thorax without differentiated presutural acrostichal bristles; postsutural dorso-centrals 4; prealar bristle very short; sternopleurals 1 : 2; hypopleura bare. Basal abdominal sternite bare; seventh sternite with a pair of short stout bristles at apex. Fore tibia unarmed at middle; mid-tibia with two posterior bristles; hind femur with a few bristles on apical half of antero-ventral surface; hind tibia with one antero-dorsal and two weak antero-ventral bristles. Third wing-vein with some rather strong setulæ at base; fourth vein but slightly curved forward at apex.

Length 8 mm.

Type, South Queensland, 1911 (*Dr. T. L. Bancroft*). One specimen.

This is the only species of this genus known to me which is pale in colour. It is apparently a typical species of *Myiospila*, possessing the wing-characters of the genotype and the cruciate interfrontal bristles as well as the ventral bristles near apex of abdomen, which this genus has in common with *Mydæa* in the female sex.

Genus IDIOHELINA, nov.

Generic characters.—Belongs to the subfamily Phaoniinæ, and is closely related to *Helina*, Robineau-Desvoidy. Differs from all allied genera known to me in having the marginal cell of uniform width almost to its apex, whereas in other genera it is gradually narrowed from apex of first vein to its apex, the apical half of the cell being narrowly wedge-shaped. The scutellum has some fine hairs below at apex—a character almost invariably found in Anthomyiinæ, but rarely in Phaoniinæ. In other respects as *Helina*. Prealar absent.

Genotype, the following species.

Idiochelina nubeculosa, sp. n.

Female.—Testaceous yellow, shining. Third antenna segment and the abdomen largely fuscous. Wings yellowish, cross-veins conspicuously infuscated, apices of wings with a faint fuscous cloud.

Frons about two-fifths of the head-width; orbits not differentiated, each with about five unequal-sized bristles; face almost vertical; parafacial not as wide as third antennal segment, at middle half as wide as height of cheek; arista with sparse long hairs; antennæ extending to three-fourths the length of face; palpi normal. Thorax without any strong presutural acrostichal bristles; postsutural dorsocentrals 3; sternopleurals 1 : 2. Fore tibia without a median posterior bristle; mid-tibia with one posterior median bristle; hind femur with one preapical antero-ventral bristle; hind tibia with one antero-ventral and one antero-dorsal bristle, the postero-dorsal surface sometimes with a weak setula. Outer cross-vein straight. Lower calyptra not much larger than upper.

Length 5–6·5 mm.

Type, Wanganui, New Zealand, 20. iii. 1920. Paratype, topotypical.

Subfamily *CŒNOSIINÆ*.

Pygophora minuta, sp. n.

Male.—Black, densely pale grey pruinescent. Interfrontalia pale yellowish testaceous; antennæ yellowish, third segment brown except at base; palpi yellow. Thorax not vittate. Abdomen black, basal tergite except in middle, apices of tergites 2 and 3, sides of all tergites, hypopygium, and entire venter yellowish testaceous. Legs entirely yellow. Calyptræ and halteres yellowish. Wings clear, veins pale.

Frons at vertex about one-fifth of the head-width, widened anteriorly; each orbit with the normal four bristles, the upper one very weak, the next two not so closely placed as in the genotype; third antennal segment extending almost to mouth-margin, about three times as long as second; arista plumose at base, bare apically. Thoracic chætotaxy normal. Abdomen compressed apically; third, fourth, and fifth tergites each with a number of flattened bristles resembling minute feathers on sides, those on fourth much larger than on third and fifth; processes of fifth sternite bare, longer than wide and but little dilated at apices; the processes at base of excavation very short, barely stalked. Antero-dorsal bristles on fore tibia very short and weak; all tibial bristles as in genotype, but much weaker. Last section of fourth wing-vein nearly twice as long as penultimate.

Length 3·5 mm.

Type, Kuranda, North Queensland, 21. vi.–24. viii. 1913, 1100 feet (*R. E. Turner*).

This species is the smallest of the genus known to me. It has no protuberance at apex of hind tibia on ventral surface, but is a true *Pygophora*, and may be separated from its allies by the peculiar flat bristles on sides of the abdomen.

XXV.—*Some Dragonflies and their Prey.*—II. *With Remarks on the Identity of the Species of* Orthetrum *involved.* By HERBERT CAMPION.

IN an earlier volume of the Ann. & Mag. Nat. Hist. (ser. 8, vol. xiii. pp. 495–504; 1914) a number of cases were recorded illustrating the exact nature of the food consumed by adult dragonflies. More recently a series of observations on the same subject has been made in Nyasaland by Dr. W. A. Lamborn, while studying the bionomics of *Glossina* on behalf of the Imperial Bureau of Entomology. These observations were made at two points on the western shore of Lake Nyasa, and an account of them was published in the 'Bulletin of Entomological Research,' vol. vi. p. 252 (1915). The more northern locality—the Lingadzi River—was visited in February 1915, and Monkey Bay, some 60 or 70 miles to the south, in April and May of the same year. At each locality the dragonflies most frequently seen to take prey belonged to a single species of *Orthetrum*, and, as is usual with the African members of that genus, the determinations have proved to be a matter of some difficulty. The two species in question resemble one another very closely, and I can see nothing to separate them either in the form of the abdomen and the female genitalia, or in the coloration of the pterostigma, membranule, and the base of the hind wing. They may be distinguished, however, by certain differences in the male genitalia, and, taking these as the criterion, I call the series from the Lingadzi River *Orthetrum brachiale*, P. de B., while to the series from Monkey Bay I apply the name *O. chrysostigma*, Burm.

The shape of the hamule in the male is sufficiently constant for immediate recognition throughout each of the two collections. The Monkey Bay series has the form figured by Dr. F. Ris for *chrysostigma* (Coll. Selys, Libell. fasc. x. p. 206; 1909). That form seems to be the common one for the species, but I have seen specimens from West Africa which show that the hamule is subject to a certain amount of variation in this as in other species of the genus. It may be said, in passing, that the species here called *chrysostigma*, and figured by Ris under that name, is somewhat different in the form of the hamule from the type-material from Teneriffe. The difference will be appreciated when comparison is made with Calvert's figure of the genitalia of Burmeister's paratype (Trans. Amer. Ent. Soc. xxv. pl. i. fig. 11; 1898), in which the anterior branch of the hamule is represented as being "without any hook at tip, straight, blunt" (*loc. cit.* p. 86).

The only male of this species from the type-locality which I have had an opportunity of examining is the one from Teneriffe preserved in the British Museum (Natural History), and referred to by M'Lachlan in Journ. Linn. Soc., Zool. xvi. p. 177 (1882). The hamules of this specimen do not correspond very exactly either with the hamule figured by Calvert or with that figured by Ris, but recalls the hamule seen in one or two specimens belonging to a series in the National Collection from Prang, Northern Territories, Gold Coast, in which the hamules are particularly variable in form. This series has been examined by Ris, and referred to *Orthetrum chrysostigma* (Coll. Selys, Libell. fasc. xvi. (2) p. 1081; 1916–1919), although the white juxtahumeral band which especially characterizes that species is not very well defined in any of the individuals composing it.

In the series from the Lingadzi the hamule agrees very well with what is found in two Gold Coast specimens determined for me as *brachiale* by Dr. Ris, who pointed out that in those specimens the hamule is larger than in the male from Nossi-bé figured in his monograph (*loc. cit.* p. 199) and in others seen by him from the Congo, etc. In these Nyasaland and Gold Coast males of *brachiale* the hamule, viewed in profile, is more like that of *chrysostigma*, but differs from it in having the hook terminating the internal branch shorter and slenderer, and also in having the external branch larger, rounder, and more prominent.

In addition to the nine males captured with prey, Dr. Lamborn sent home forty-two others taken in the same locality. Of these fifty-one specimens, forty-nine prove to have a more or less common type of hamule (of which fig. 2 may be taken as an example), one has the form figured by Ris for *brachiale* (fig. 1), and the remaining example may be referred to *chrysostigma* (fig. 3). It may be observed that the kind of hamule represented in fig. 1 is barely distinguishable from that of *O. stemmale wrighti*, from Seychelles. Moreover, the antenodals of that particular specimen of *O. brachiale* happen to be dark, like those of the other insect mentioned. Nevertheless, the two species can always be distinguished from each other by the difference in the coloration of the head and the costa.

When not obscured by pruinosity or by post-mortem changes, the coloration of the thorax is normally quite different in the two species, although the pattern itself remains much the same in both. In *chrysostigma* the dorsum is yellowish brown as far as the dark brown antehumeral streak, and the lower part of the mesepisternum is pale brown; a broad ivory-white stripe lies just below the humeral suture, and is bordered on each side by a streak of dark brown; otherwise, the sides of the thorax are yellowish brown.

In characteristic examples of *brachiale*, on the other hand, the ground-colour is greenish throughout, with dark markings as in *chrysostigma*, added to which there are two dark stripes crossing the metathorax; but in Nyasaland, at least, the dorsum tends to become very pale, and the mesepimeral stripe tends to take on a whitish hue. Just as the Lingadzi specimens of *brachiale* vary in the direction of *chrysostigma*, so do the Monkey Bay examples of *chrysostigma* vary in the direction of *brachiale*, and in many cases the thoracic colour-scheme affords little guidance to the identification of the species.

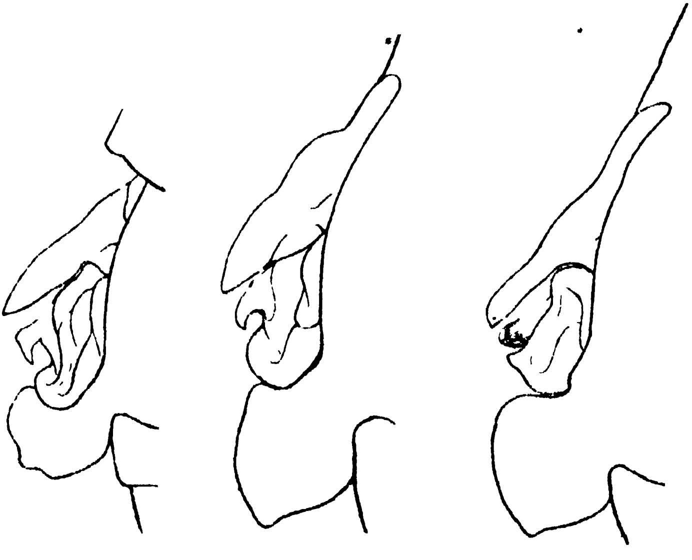

Fig. 1. Fig. 2. Fig. 3.

Genitalia of three males of *Orthetrum* from the Lingadzi River, Nyasaland.

Fig 1.– *O. brachiale*, P de B., 23. ii. 15.
Fig 2 –*O. brachiale*, P. de B., 4 iii. 15.
Fig 3 – *O chrysostigma*, Burm , 8. ii. 15.

P. Highley, cam. luc. et del.

The black markings on the abdomen are distributed in different ways in the two species, but, as they are seldom visible in dried specimens, they are not of much value as aids to identification. When semi-adult individuals are met with, however—individuals, that is, which are free alike from pruinosity and discoloration—it is seen that *chrysostigma* lacks the mid-dorsal black line and certain other black markings which characterize the abdomen of *brachiale*. The condition of the Nyasaland specimens now under consideration does not permit of any useful comparison of abdominal markings being made, either between themselves or with suitably preserved material of *chrysostigma* and *brachiale* from other localities.

The older males of *brachiale* from the Lingadzi have the distal two-thirds of their wings tinged with brown. In the female sex the colour is more intense and suffuses the entire wing. In the males of *chrysostigma* from Monkey Bay the wings remain clear, and very little colour makes its appearance in the wings even of the females.

The eyes of the Lingadzi *brachiale* are decidedly green in both sexes, whereas the eyes of the *chrysostigma* from Monkey Bay are consistently brown. I have no notes as to the eye-colours in the living insects.

The entire collection of captors and prey, set out in the subjoined tables (pp. 243–245), has been presented to the British Museum (Natural History) by the Imperial Bureau of Entomology.

From the Lingadzi River District, Nyasaland (Dr. W. A. Lamborn).

Collector's no.	Species of Odonata.	Species of Prey.	Date.
42 *a*.	*Orthetrum brachiale*, P. de B., ♂.	*Glossina morsitans*, Westw.	8. ii. 15.
42 *b*.	*O. brachiale*, ♂.	*G. morsitans*.	10 ii. 15.
42 *c*.	*O. brachiale*, ♂.	An undetermined Asilid fly.	10. ii. 15.
42 *d*.	*O. brachiale*, ♂	A Tachinid fly (*Setulia fasciata*, Meig.). Identified by Dr. J. Villeneuve.	11. ii. 15.
42 *e*.	*O. brachiale*, ♂.	A Tachinid fly (*Tachina* sp. - in poor condition).	12. ii. 15.
42 *f*.	*O. brachiale*, ♂.	A Tachinid fly (*Sarcophaga* sp., ♀ —indeterminable).	12 ii. 15.
42 *g*.	*O. icteromelas*, Ris, ♀.	The Tabanid fly *Tabanus fuscipes*, Ric.	11 ii. 15.
42 *h*.	*O. icteromelas*, ♀.	*Glossina morsitans*	15 ii. 15
42 *i*.	*O. chrysostigma*, Burm., ♀.	A Tachinid fly (*Setulia fasciata*. Meig.). Identified by Dr. J. Villeneuve.	16. ii 15.
42 *j*.	*O. brachiale*, ♂.	An undetermined Asilid fly.	17. ii. 15.
42 *k*.	*O. brachiale*, ♂.	A Syrphid fly (*Lathyrophthalmus* sp., near *metallescens*, Loew).	17. ii. 15.
42 *l*.	*O. brachiale*, ♂.	A Syrphid fly (*Melanostoma ? floripeta*, Speis.).	19. ii. 15.

From the Monkey Bay District, Nyasaland (Dr. W. A. Lamborn).

Collector's no.	Species of Odonata.	Species of Prey.	Date.	Remarks.
81 *a.*	*Orthetrum chrysostigma*, ♀.	*Glossina morsitans.*	25. iv. 15.	"Seen to take a tsetse, which it ate before could catch it."—*W. A. L.*
81 *b.*	*O. chrysostigma*, ♂.	*G. morsitans.*	23. iv. 15.	Seen to take prey.
81 *c.*	*O. chrysostigma*. ♂.	A Muscid fly, *Musca* sp. (too much damaged for complete identification).	23. iv. 15.	
81 *d.*	*O. chrysostigma*, ♂.	*Glossina morsitans.*	23. iv. 15.	
81 *e.*	*O. chrysostigma*, ♂.	*G. morsitans.*	23. iv. 15.	"Seen to take a tsetse while hovering round a native party, but, as it retired to a distance, it ate all its prey before capture."—*W. A. L.*
81 *f.*	*O. chrysostigma*, ♂.	*G. morsitans.*	24. iv. 15.	"This was felt to brush my forehead on the wing as I was digging for tsetse pupæ. When it settled I saw that it had taken a tsetse."—*W. A. L.*
81 *g.*	*O. chrysostigma*, ♂.	*G. morsitans.*	24. iv. 15.	Seen to take prey.
81 *h.*	*O. chrysostigma*, ♂.	The Nemestrinid fly *Atriadops vespertilio*, Loew. Identified by Mr. F. W. Edwards.	24. iv. 15.	
81 *i.*	*O. chrysostigma*, ♀.	A Cercopid bug, received in poor condition, but apparently belonging to the genus *Clovia*.	3. v. 15.	Found feeding on prey.

81 *j.*	*O chrysostigma*, ♂.	*Glossina morsitans.*	3. v. 15.	
81 *k.*	*O. chrysostigma*, ♂.	*G. morsitans.*	6. v. 15.	
81 *l.*	*O. chrysostigma*, ♀.	*G. morsitans.*	6. v. 15.	"Seized its prey to one side of me, and this turned out to be a tsetse. I was returning from a place 2 miles distant where tsetse abound, but I was unaware that any were following me."—*W. A. L.*
81 *m.*	*O. chrysostigma*, ♂.	*G. morsitans.*	6. v. 15.	
81 *n.*	*O. chrysostigma*, ♂.	*G. morsitans*	8. v. 15.	
81 *o.*	*O. chrysostigma*, ♂.	*G. morsitans*	8. v. 15.	
81 *p.*	*O. chrysostigma*, ♀.	*G. morsitans*	8. v. 15.	
81 *q.*	*O. chrysostigma*, ♀.	*G. morsitans.*	10. v. 15.	"Felt and heard to brush against my shoulder after a tsetse unsuccessfully. It then made a second attempt to secure a tsetse on the wing, again unsuccessfully, and finally it caught one which I drove off my leg."—*W. A. L.*
81 *r.*	*O. chrysostigma*, ♂.	*G. morsitans*	10. v. 15	
81 *s.*	*O. chrysostigma*, ♀.	*G morsitans*	10. v. 15.	
81 *t.*	*O. chrysostigma*, ♂.	*G. morsitans*	10. v. 15.	
81 *u.*	*O. chrysostigma*, ♀.	*G. morsitans*	10. v. 15	
81 *v.*	*O. chrysostigma*, ♀.	*G. morsitans.*	10. v. 15.	
81 *w.*	*O. chrysostigma*, ♂.	*G. morsitans.*	12. v. 15.	
83 *a.*	*Crocothemis erythræa*, Brullé, ♀.	*G. morsitans.*	8. v. 15.	"Seen to catch tsetse."
84 *a.*	*Orthetrum chrysostigma*, ♂.	The Bombyliid fly *Thyridanthrax abruptus*, Loew. Identified by Mr. F. W. Edwards.	9. v. 15.	

XXVI.—*Diagnoses of some Lichens.*

By Prof. Dr. C. Mereschkovsky.

During the last ten years I have described, in various publications, quite a number of new lichens. As, with a few exceptions, I did not conform with the international convention requiring a Latin diagnosis, I have considered it desirable to add here to my previous descriptions in Russian or French short Latin diagnoses for the greater number of new forms.

All my collections and notes having been left in Russia, I regret that in some cases the diagnoses are not so complete as they might be.

Usnea florida, var. *divaricata*, Mer.

Mereschkovsky, Addit. Lichenogr. Ross. i., Oest. Bot. Zeitschr. 1921.

Thallus mediocris, circiter 7–8 centim. longus, erectus, ramis divaricatis, fibrillis numerosis ut in *Usnea barbata* typica munitis.

Spec. orig. (numeros.) * in herb. meo Kazani.
Rossia Media, Esthlandia.

Usnea hirta, forma *minutissima*, Mer.

Mereschkovsky, Beitr. z. Kenntn. Flecht. Reval, Kazan, 1909, p. 10; id. Lich. Rossiæ exsicc. no. 53.

Thallus minutus, 2–3 centim. haud superans, pulvinulas haud formans, parce sorediatus vel nudus, semper sterilis.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media, Fennia, Tauria. Etiam in Gallia! et Helvetia!

Usnea plicata, forma *vagans*, Mer.

Mereschkovsky, Beitr. z. Kenntn. Flecht. Reval, Kazan, 1909.

Thallus elongatus, subscabrosus, liberus, substrato haud affixus.

Spec. orig. in herb. meo Kazani.

The absence of any trace of damage shows that they are not simply fragments torn off from normal specimens.

Esthland; Reval, living on trunks of *Pinus*.

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* "(numeros.)" means at least twenty good, identified specimens; "(numerosissim.)" about one hundred specimens.

Ramalina calicaris, var. *taurica*, Mer.

Mereschkovsky, "Notes sur quelques *Ramalina* de Russie," Bull. Soc. bot. d. Genève, t. xi. 1919, p. 152, fig. 1, *c.c.*

Thallo parvulo, altitudine circiter 3 centim., laciniis angustis, circiter 1–1·5 millim. latis, haud canaliculatis. Apotheciis ramulis appendiculariis, latitudine 1·5–3 millim., cupuliformibus. Sporis rectis vel interdum subasymmetricis.

Conf. cum *Ramalina elegans* (Bagl.-Car.), Stizenb.
Spec. orig. in herb. meo Kazani.
Tauria. Ad ramulos *Celtidis australis.*

Forma *macrocarpa*, Mer.

Mereschkovsky, *l. c.* p. 153, fig. 1, *b.*

Apotheciis majoribus, latitudine circiter 5 millim., marginibus tenuioribus, haud involutis, receptaculo subtus reticulatis, ramulo appendiculario destitutis.

Spec. orig. in herb. meo Kazani.
Tauria. Ad ramulos *Celtidis australis.*

Forma *tenella*, Mer.

Mereschkovsky, *l. c.* p. 153, fig. 1, *a.*

Laciniis angustioribus, vulgo 0·5 millim. (0·3–0·7 millim.) latis, ad apicem attenuatis acuminatisque; apotheciis minoribus, latitudine 0·5–0·8 millim.

Spec. orig. in herb. meo Kazani.
Tauria. Ad ramulos *Celtidis australis.*

Ramalina pollinaria, forma *elegantella*, Mer.

Mereschkovsky, Nachtrag zur Flechtenliste aus d. Umgegend Revals, Kazan, 1913, p. 59.

Thallus pulvinulas parvas formans, læte cinereo-glaucescens, coriaceus, laciniis brevibus, erectis, passim latioribus, apicibus suberosis.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia, Reval.

Var. *humilis*, forma *conglobata*, Mer.

Mereschkovsky, *l. c.* Hedwigia, 1919, p. 190.

Thallus minor quam in var. *humili*, densior, pulvinulos subglobosos formans.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia, Reval.

Ramalina populina, forma *laxiuscula*, Mer.

Mereschkovsky, Nachtrag zur Flechtenl. Umgeg. Revals, Kazan, 1913; id. Contrib. fl. lich. Crimée, Ann. d. Sc. nat. Botanique, 1921 (cum fig.).

Thallus ut in typo, sed laciniis magis laxiusculo dispositis.

Spec. orig. in herb. meo Kazani.
Esthlandia, Tauria.

Evernia thamnodes, forma *furfurascens*, Mer.

Mereschkovsky, Contrib. fl. lich. envir. Kazan, Hedwigia, 1919, p. 193.

Thallus obscurior, cyanescente-viridis, dense isidiis elongatis sorediosisque omnino obtectus.

Spec. orig. (numeros.) in herb. meo Kazani.
Kazan (Rossia Media).

Forma *parva*, Mer.

Mereschkovsky, Contrib. lich. gouv. Vladimir, Arbeit. (Trudy) d Naturforschges. Univ. Kasan, 1911; etiam in Hedwigia, 1919, p. 193.

Thallus parvus, altitudine circiter 1–2 centim.

Spec. orig. (numeros.) in herb. meo Kazani.
A form analogous with the forma *minutissima*, Mer., of *Usnea hirta*, with which it is often associated.
Rossia Media.

Forma *subnuda*, Mer.

Mereschkovsky, Contrib. fl. lich. envir. Kazan, Hedwigia, 1919, p. 193.

Thallus lætior, stramineus, levis, esorediosus vel vix sorediosus.

Spec. orig. in herb. meo Kazani.
Comparanda cum forma *esorediosa*, Hue.
Rossia Media (Kazan) et Sibiria.

Cetraria crispa, forma *albinea*, Mer.

Mereschkovsky, Addit. Lichenogr. Ross. i., Oest. Botan. Zeitschr. 1921.

Thallus erectus vel suberectus, cæspitosus, haud vel parce crispus, albidus, subtus interdum passim albus, basin versus fulvescens.

Spec. orig. in herb. meo Kazani.
Sibiria.

Forma *vagans*, Mer.

Mereschkovsky, Nachtrag zur Flechtenl. Umgeg. Revals, Kazan, 1913.

Spec. orig. (numerosissim.) in herb. meo Kazani.

Cetraria tenuissima, forma *stepposa*, Mer.

Mereschkovsky, Contrib. fl. lich. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus liberus, *opacus*, laciniis paullulum minus attenuatis.

Spec. orig. (numerosissim.) in herb. meo Kazani.
Rossia meridio-orientalis, Tauria.

Forma *vagans*, Mer.

Mereschkovsky, Nachtrag zur Flechtenl. Umgeg. Revals, Kazan, 1913.

Thallo libero, nitido, sphæroideo-rotundato, ramulis circa ut in typo.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia, Reval.

Parmelia camtschadalis, forma *ampliata*, Mer.

Mereschkovsky, Addit. Lichenogr. Ross. ii., in Annuaire du Conservat. et Jard. bot. d. Genève, vol. xxi. 1921.

Laciniis latioribus, lanceolatis; apotheciis minoribus, circiter 1·5 millim. latis, ad superficiem thalli disseminatis.

Spec. orig. (1) in herb. Conservat. bot. Genevæ, (2) in herb. Brit. Mus.
Camtschatka.

Forma *subnuda*, Mer.

Mereschkovsky, *l. c.*

Thallus laciniis abbreviatis, subtus glabris, rhizinis destitutis vel rarissime brevissimis, ad margines hinc inde parce rhizinis ornatis.

Spec. orig. in herb. Conservat. botan. Genevæ.
Camtschatka.

Parmelia conspurcata, forma *subdispersa*, Mer.

Mereschkovsky, Sched. ad Lich. tic. exs. (no. 82), in Annuaire du Conservat. et Jard. bot. d. Genève, vol. xxi. 1919, p. 200.

Thallus paullulum lætior, castaneus, e lobis subdispersis, rosulas haud vel raro formantibus, compositus. $CaCl_2O_2+$.

Spec. orig. (1) in herb. Conservat. botan. Genevæ, (2) in Mereschkovsky, Lich. ticin. exs. no. 82.
Geneva (Helvetia).

Forma *velutina*, Mer.

Mereschkovsky, Contrib. lich. Vladimir Arbeiten (Trudy) d. Naturf.-Ges. Univ. Kazan, 1911.

Pars centralis thalli ob iridio denso velutina.

Spec. orig. in herb. meo Kazani.
Rossia Media.

Parmelia physodes, forma *compacta*, Mer.

Mereschkovsky, Beitr. Kenntn. Flecht. Umgeg. Revals, Kazan, 1909.

Thallus compactus, laciniis mutuo pressione longitudinaliter subcarinatis, centro irregulariter contortu-plicatis.

Spec. orig. (numeros.) in herb. meo Kazani. Spec. a *Long* missum haud optimum.
Esthlandia, Fennia.

Forma *elegans*, Mer.

Mereschkovsky, Contrib fl. lichénol. Kazan, Hedwigia, 1919, p. 97, tab. ii. figs. 3, 4.

Thallus rosulas 1·5–5 centim. latas formans, tenuiter elegantiorque dissectus, incisiones foraminas rotundas formans.

Spec. orig. (numeros.) in herb. meo Kazani.
Ad saxa arenacea in Fontainebleau (Gallia).

Forma *pinnata*, Mer.

Mereschkovsky, Addit. Lich. Rossiæ, i., Oesterr. Botan. Zeitschr. 1921.

Thallo superne albido, nitidiusculo, lobis planiusculis, angustioribus, discretis, pinnatiforme dissectis a forma typica valde differt.

Spec. orig. in herb. meo Kazani.
Sibiria.

Forma *vittatoides*, Mer.

Mereschkovsky, Nachtr. Flechtenl. Umgegend. Revals, Kazan, 1913; id. Contrib. fl. lichén. envir. Kazan, Hedwigia, 1919, p. 197, tab. ii. fig. 2.

Thallus effusus, rosulas nondum formans, laciniis valde discretis, laxe ad substratum affixis, subimbricato-superpositis, angustis, 0·7–1 millim., raro ultra latis, sublinearibus, palmatim subdichotomice divisis, hinc inde nigro-marginatis; thallus haud sorediosus, colore ut in typo.

Spec. orig. (numerosissim.) in herb. meo Kazani.
Confer. cum forma *stenophylla*, Harm. Lich. d. Fr. p. 507.
Esthlandia; Austria.

Parmelia prolixa, var. *tenuisecta*, Mer.

Mereschkovsky, Contrib. fl. lichén. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus liberus vel laxe rhizinis brevibus rarisque ad granulos terræ stepparum adfixus, minutus, circiter ½ centim. latus, nigrescens, nitidus, valde irregulariterque dissectus, laciniis discretis, angustis, irregularibus, marginibus quasi erosis; subtus pallidus, subcaniculatus. Sterilis.

Spec. orig. (numeros.) in herb. meo Kazani.
Tauria.

Parmelia saxatilis, forma *plumbea*, Mer.

Mereschkovsky, Nachtrag z. Flechtenl. Umgeg. Revals, Kazan, 1913.

Thallo cinereo-obscuro vel cinereo plumbeo, isidiis ut in forma *aizonii.*

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia, Reval.

Parmelia sorediata, forma *tenuatula*, Mer.

Mereschkovsky, Nachtrag z. Flechtenl. Umgeg. Revals, Kazan, 1913.

Thallo minore, lobis angustissimis a typo differt.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia, Reval.

Parmelia sulcata, forma *nitida*, Mer.

Mereschkovsky, Beitr. z. Kenntn. d. Flecht. Umgeb. v. Reval, Kazan, 1909 (sub var. *lævis*); vide etiam Hedwigia, 1919, p. 199.

Thallus cinereus ut in typo, haud albidus, nitidus, lævis vel passim rugulosus, esorediatus, laciniis discretis, elongatis, adnatis, linearibus, 2–3 millim. latis, apicibus haud fuscescentibus.

Spec. orig. in herb. meo Kazani.
Rossia Media; Esthlandia.

Forma *tuberosa*, Mer.

Mereschkovsky, Beitr. z. Kenntn. d. Flecht. Umgeb. v. Reval, Kazan, 1909; id. Contrib. fl. lich. envir. Kazan, Hedwigia, 1919, p. 199, tab. ii. fig. 1.

Thallus rosulas parvas, 2–3 centim. (usque ad 4·5 centim.) latas formans, compactus, laciniis brevibus, late-rotundatis, circiter 4 millim. latis, concretis, subimbricatis, centro irregulariter tuberosus.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media; Esthlandia *.

Parmelia taurica, Mer.

Mereschkovsky, Schedulæ ad Lich. Rossiæ exsiccatos, Kazan, 1913; id. Contrib. fl. lichén. Crimée, Ann. d. sc. nat. Botanique, 1921 (cum fig.).

Thallus liberus, circiter 2·5 3·5 (1·5–5) centim. latus, plus minus compressus, parce irregulariterque ramosus, fuscus, opacus, utrinque similis, interdum ad apicem solum ambi lateris subinælibus; superficie inæqualiter subplicato-rugosus, neque sorediosus, nec isidiosus; laciniis circiter 0·5 millim. latis, subteretis vel tereti-compressis, apicibus sæpe breviter bifurcatis, rhizimis omnino destitutus. Semper sterilis.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 7.
Tauria et in steppas Kirgisorum.

Forma *congesta*, Mer.

Mereschkovsky, Contrib. fl. lichénol. d. l. Crimée, in Ann d. sc. nat. Botanique, 1921 (cum fig.).

Thallus minor, circiter 1·5–2 centim. (0·7–2·6 centim.), congestus, verrucoso- vel granuloso-perrugatus, ambitu lobis discretis destitutus vel parce sparsim abbreviatis.

Spec. orig. (numeros.) in herb. meo Kazani.
Tauria.

Parmelia vagans, forma *elegans*, Mer.

Mereschkovsky, Schedul. ad Lich. Rossiæ exsiccatos, Kazan, 1913 (no. 58).

Thallo minore, subtus nigro, laciniis angustioribus, marginibus magis revolutis, sæpe conniventibus a forma typica differt.

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* The forma *farinosa*, Mer., which I have described in 'Hedwigia,' 1919, p. 198, is nothing else but the var. *pruinosa*, Harm. ('Lichens de France,' p. 567).

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 58.

Rossia Media; Astrachan; Tauria; Caucasus.

Var. *sibirica*, Mer.

Mereschkovsky, Additam. ad Lichenogr. Rossiæ, i., Oesterr. Bot. Zeitschr. 1921.

Thallus minor, magis applanatus, rosulas circiter 1·5–2 centim. latas formans, laciniis brevibus, planiusculis, subtus pallidus. Sterilis.

Spec. orig. in herb. meo Kazani.

Sibiria: Irkutsk (Vercholensk).

Squamaria crozalsiana, Mer.

Thallus crassiusculus, effusus, pallido-albescens, centro irregulariter gyroso-areolatus, areolis convexis, confertis, ambitu laciniis parum evolutis. Apothecia rarissima; sporæ simplices, incolores. Ad saxa calcarea murorum.

Spec. orig. (numeros.) in herb. meo Kazani.

Beziers (Hérault), Gallia.

Squamaria muralis, var. *brunneola*, Mer.

Mereschkovsky, Schedulæ ad. Lich. Ross. exsiccatos, Kazan, 1913.

Thallo lobis applanatis sicut in forma typica et colore thalli brunneolo ut in *Squamaria garovaglii*.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 14, (3) in herb. Conservat. botan. Genevæ.

Tauria, Helvetia (Lugano)!

Comparanda cum forma *riparium*, Flot. Koerber Syst. p. 115.

Forma *tenuisecta*, Mer.

Mereschkovsky, Contrib. fl. lichén. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921 (cum fig.).

Laciniis angustioribus, circiter 0·2–0·3 millim. latis, tenuiter dissectis.

Spec. orig. in herb. meo Kazani.

Tauria.

Var. *maroccana*, Mer.

Mereschkovsky, Contrib. lich. Vladimir Travaux (Trudy) d. l. soc. d. Natural. d. l'Univ. d. Kazan, vol. xlii. 1911.

Apotheciis convexis, pallidis.

Spec. orig. in herb. meo Kazani.
Gubernia Astrachan. Etiam in Marocco occurrit! (vide exempl. in herb. meo). Forsan melius ut forma considerenda.

Var. *orientalis*, Mer.

Mereschkovsky, Addit. ad Lichenogr. Rossiæ, i., Oesterr. Bot. Zeitschr. 1921.

Thallus stramineus, nitidus, lobis carinato-convexis.

Spec. orig. in herb. meo Kazani.
Asia Media, in jugo Mugodshary in provincia Ural.

Squamaria pruinosa, var. *chersonensis*, Mer.

Mereschkovsky, Contrib. fl. lichénol. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus parce vel vix pruinosus, centro versus obscurior, sublividus, apothecia fusco nigra, nuda vel leviter pruinosa.

Spec. orig. in herb. meo Kazani.
Tauria.

Var. *griseola*, Mer.

Mereschkovsky, Addit ad lichenogr. Rossiæ, ii., in Annuaire du Conservatoire et Jard. bot. d. Genève, vol. xxi. 1921.

Thallus dense pruinosus, griseolus (haud albus ut in typo), apothecia pruinosa.

Spec. orig. in herb. meo Kazani.
Tauria.

Forma *conferta*, Mer.

Mereschkovsky, *l. c.*

Thallus griseolus, apothecia numerosissima, conferta, elevata, mutuo pressione irregulares flexuosaque.

Spec. orig. ibidem.
Tauria.

Squamaria rubina, forma *monophylla*, Mer.

Mereschkovsky, Addit. ad lichenogr. Rossiæ, i., Oesterr. Bot. Zeitschr. 1921.

Thallus monophyllus rosulas parvas subapplanatas formans.

Spec. orig. (numeros.) in herb. meo Kazani.
Ural in gubern. Perm.

Squamaria teicholea, forma *obscura*, Mer.

Apotheciis obscurioribus, nigricantibus vel nigris.

Spec. orig. in herb. meo Kazani.
Italia, Capri, ad saxa calcarea.

Lecanora albella, var. *peralbella*, forma *superfusa*, Mer.

Mereschkovsky, Nachtr. z. Flechtenliste Umgeg. Revals, Kazan. 1913.

Apothecia parva, distantes, haud angulosa, disco plano, dense pruinoso.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia: Reval.

Lecanora albescens, forma *confertiuscula*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora*.
Lecanora albescens, forma *verrucosa*. Mer. Nachtr. z. Flechtenl. Umg. Revals, Kazan, 1913 (errore).

Thallus parum evolutus, haud effusus, insulas interdum plus minusve orbiculares formans. Apothecia ut in typo, sed agglomerata confertaque, mutuo pressione plus minusve præsertim centrum versus valde elevata, pulvinulos formans, nondum in thallo immersa.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Generum Lichenum (1913), *Lecanora*, i. no. 32.
Esthlandia: Reval.

Forma *granulosa*, Mer.

Mereschkovsky, *l. c.* etiam in hujus Tabulæ Generum Lichenum, *Lecanora*, i. no. 33.

Thallus albus, e granulis minutis subdispersis vel dispersis compositus, apotheciis minoribus.

Spec. orig. in herb. meo Kazani et in Tab. Gen. Lich.
Esthlandia: Reval.

Var. *dispersa*, forma *aggregata*, Mer.

Mereschkovsky, *l. c.* etiam in hujus Tabulæ Generum Lichenum, *Lecanora*, i. no. 36 (e Pyren.-Orient.).

Thallo albo, hinc inde visibili, apotheciis partim aggregatis.

Spec. orig. in herb. meo Kazani et in Tab. Gen. Lich.
Esthlandia: Reval. Pyren.-Orient. (Gallia).

Var. *muralis*, forma *obscura*, Mer.

Mereschkovsky, *l. c.*

Apotheciis obscuris, nigricantibus. Ad muros calcareo et cementum earum.

Spec. orig. in herb. Conservat. botan. Genevæ.
Geneva (Helvetia).

Lecanora atra, var. *urceolata*, Mer. (Mass. in herb.).

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1913 (no. 60).

Apothecia thallo immersa, habitu valde apothecia Aspiciliarum commemorant. Ad saxa dioritica.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 60.
Tauria.

Lecanora campestris, forma *subimmersa*, Mer.

Mereschkovsky, *l. c.*, etiam in hujus Tabulæ Generum Lichenum (1913), *Lecanora*, ii. no. 41 (ex Agde, Hérault (Gallia)).

Apotheciis nigrescentibus, in thallo cinereo subimmersis.

Spec. orig. (1) in herb. meo Kazani, (2) in Tab. Gen. Lich. no. 41.
Agde (Gallia).

Var. *docellina*, Mer.

Mereschkovsky, Tabulæ Generum Lichenum (1913), *Lecanora*, ii. no. 38 (ex Gallia, Docelle, Vosges).

Thallus parum evolutus, dispersus, granulatus. Ad saxa arenacea.

Spec. orig. (1) in herb. meo Kazani, (2) in Tab. Gen. Lich. no. 38.
Gallia.

Lecanora carpinea, forma *carneopallida*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. Umgeg. Revals, Kazan, 1913.

Apotheciis disco cervino-carneo vel læte brunneolo, semper lætiore quam in forma *nuda*, Elenk., plus minus (sed semper leviter) pruinoso, rarius nudo.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia: Reval.

Forma *distantella*, Mer.

Mereschkovsky, Enum. lich. in prov. baltica hucusque cognitorum, Kazan, 1913.

Apothecia minores, orbicularia, semper valde distantes, margine bene evoluto, disco plano, pruinoso. Comparanda cum forma *leptyrodem*, Nyl.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval.

Forma *obscura*, Mer.

Mereschkovsky, Nachtr. z. Flechtenfl. Umgeg. Revals, Kazan, 1913.

Apotheciis obscuris, nigrescentibus, nudis vel subnudis.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia: Reval.

Var. *latericola*, Mer.

Mereschkovsky, Contrib. fl. lichénol. envir. Kazan, Hedwigia, 1919, p. 202.

Thallus parum evolutus, evanescens, cinereo-albescens, H_2O—. Apothecia parva vel submedia, disco convexo, livido griseo, pruinoso, margine thallino integro. In lateribus.

Spec. orig. (numeros.) in herb. meo Kazani.
Kazan.

Var. *fusconigra*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora*.

Thallus cinereus. Apothecia parva, 0·3–0·7 millim. lata (1·2 millim. haud superantes), numerosa, conferta, angulosa, primum applanata, demum elevata et mutuo pressione nonnihil flexuosa, disco primum plano vel concavo, demum convexo, livido-fusco, fusco vel fusco-nigro, interdum nigrescente, leviter pruinoso vel subnudo. Apothecia disco $CaCl_2O_2$+ flavescente, margine thallino tenui, albido-cinereo, rarius subevanescente.

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ carpineæ*).
Geneva.

Var. *minuta*, forma *expallida*, Mer.

Mereschkovsky, *l. c.*

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ carpineæ*).

Lecanora chlarona, forma *albinea*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora*.

Thallus determinatus vel subeffusus, crassiusculus vel sat crassus, granuloso-verrucosus, haud pulverulentus, lacteo-albus, colore griseo vel glaucescente (ut plus minus in typo videtur) omnino destitutus; apothecia media, circiter 1 (usque ad 1·3) millim. lata, parum elevata vel subapplanata, subconferta vel contigua, interdum mutuo pressione subangulosa, disco planiusculo vel convexiusculo, brunneo vel rufo-fusco (ut in forma *applanata*, Mer.), nudo, margine thallode mediocre, parum vel vix discum superante, distincto minuteque granulato-crenulato.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*), (2) in herb. Brit. Mus.
Lugano (Helvetia italica).

Forma *applanata*, Mer.

Mereschkovsky, *l. c.*

Thallus indeterminatus, sat tenuis, crassitudine ut in forma typica, ambitu in hypothallo albo evanescens, granulosus, albidus (simul ut in forma *albinea*), in herbario tempore sordide lutescens; apothecia mediocria, vulgo 0·8–1·3 (usque ad 1·5) millim. lata, orbicularia, numerosissima, conferta, sed haud compressa, nec angulosa, plana et arcte adnata, quasi adpressa, una altera haud superantes, disco plano (statu juvenili concaviusculo), rufo-fusco vel læte brunneolo (couleur de cuir), nudo; margine mediocri vel subtenui (ut in forma typica), disco parum superante, albo (thallo concolore), tenuiter, distincto regulariterque granulato-crenulato (valde distinctior quam in Lich. ticin. exs. no. 14 et 15).

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*), (2) in herb. Brit. Mus.

Forma *griseola*, Mer.

Mereschkovsky, *l. c.*

Thallus bene evolutus, haud albus; apotheciis dense griseo-pruinosis, disco rugoso.

Spec. orig. in herb. meo Kazani.
Austria Inferior.

Forma *pallescens*, Mer.

Mereschkovsky, *l. c.*

Thallus subevanescens, albus; apotheciis pallide testaceis, sæpe subdifformibus, margine tenui, albo, minute granulato-crenulato.

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*).
Lugano (Helvetia italica).

Var. *coronata*, forma *livida*, Mer.

Mereschkovsky, Nachrag z. Flechtenl. a. d. Umgeg. Revals, Kazan, 1913.

Apotheciis disco livido.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval.

Var. *incurvodentata*, Mer.

Mereschkovsky, Schedulæ ad Lich. ticin. exsiccatos, in Annuaire d. Conservat. et Jard. bot. d. Genève, vol. xxi. 1919, p. 152.

Thallus et margo apotheciorum obscuriores (quam in typo), glauco-cinerei. Apothecia latitudine ut in typo sed minus regularia, margine tenuiore, inciso-crenulato, crenulis incurvo-dentatis, simul ut in *Lecanora allophana*. Epithecium granulosum ut in typo, superne strato amorpho haud instructum.

Spec. orig. (1) in herb. Conservat. botan. Genevæ, (2) in Mereschkovsky, Lich. ticin. exs. no. 16.
Geneva (Helvetia).

Forma *convexa*, Mer.

Mereschkovsky, *l. c.* p. 216.

Thallus cinereus; apothecia brunneola, convexiuscula vel convexa, interdum subbotryosa, margine tenui vel subevanescente, thallo concolore.

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*).
Geneva (Helvetia).

Forma *obscura*, Mer.

Mereschkovsky, *l. c.*

Thallo et margine apotheciorum griseo-plumbeis, disco obscure fusco-nigro, apotheciis 0·8–1·6 millim.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*), (2) in herb. Brit. Mus.
Geneva (Helvetia).

Forma *subpruinosa*, Mer.

Mereschkovsky, *l. c.*

Thallus sordide albescens vel griseolo-albineus; apothecia brunnea, margine tenui; integro, vel vix crenulato et tum crenulis incurvo-dentatis.

Spec. orig. in herb. Brit. Mus.

Var. *lividula*, Mer.

Mereschkovsky, *l. c.*

Thallus cinereus, tenuis; apothecia mediocria, 0·5–1 millim. lata, sparsa vel subconferta, applanata, disco livido vel livido-cervino, convexo, interdum ruguloso, nudo vel subnudo, margine tenui, integro vel vix crenulato.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*), (2) in herb. Brit. Mus.
Lugano (Helvetia italica).

Var. *minor*, forma *minutissima*, Mer.

Mereschkovsky, *l. c.*

Thallus sordide albo-cinerascens; apothecia minora, 0·08–0·5 millim., vulgo invisibilia oculo nudo.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulas *Lecanoræ chlaronæ*), (2) in herb. Brit. Mus.
Lugano (Helvetia italica).

Lecanora coarctata, forma *depauperata*, Mer.

Mereschkovsky, Tabulæ Generum Lichenum, *Lecanora*, iii. no. 59 (ex Austria).

Thallus griseus, parum evolutus, e granulis minutis rare sparsis, interdum subcrenulatis compositus; superficie lævi, haud farinosa nec sorediosa.

Spec. orig. (1) in herb. meo Kazani, (2) in Tab. Gen. Lich. no. 59.
Esthlandia: Reval. Austria Inferior (Mönichkirchen).

Lecanora coilocarpa, forma *xylita*, subforma *pruinata*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora*.

Apotheciis pruinosis (in forma *xylita* apothecia semper nuda sunt).

Spec. orig. in herb. Conservat. botan. Genevæ.
Lugano (Helvetia italica).

Var. *fuscorufa*, Mer., forma *convexiuscula*, Mer.

Mereschkovsky, *l. c.*

Thallus cinereus, minute granulosus; apothecia sparsa, minora quam in typo, circiter ut in forma *virella* hujus varietatis, disco convexiusculo vel convexo, testaceo-rufescente vel fusco-rufo vel fusco, nudo, margine tenui vel tenuissimo vel demum subevanescente, integro vel sæpius plus minus minute crenulato. Unacum varietate *fuscorufa*.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ coilocarpæ*), (2) in herb. Brit. Mus., (3) in herb. Parisii (Muséum), (4) in herb. Univ. Upsalæ, (5) in herb. Harv. Univ. Cambridge (U.S.A.).
Lugano (Helvetia italica).

Forma *subpruinosa*, Mer.

Mereschkovsky, *l. c.*

Apothecia paullum majora, discreta, regulariter orbicularia, disco fusco, leviter subpruinoso, convexiusculo. Differt a *Lecanora atrynea*, in Norrl. et Nyl. Herb. Lich. Fenn. no. 132, apotheciis haud planis vel concavis, ut in *atrynea*, sed convexiusculis.

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ coilocarpæ*).
Lugano (Helvetia itálica).

Lecanora crenulatissima, Mer.

Mereschkovsky, Excurs. lichénol. dans les steppes Kirghises (Mont Bogdo); Troudy (Travaux) d. l. Soc. des Natur. d. l'Univ. d. Kazan, Année 1911.

Thallus albineus, mediocris, subgranulatus; apothecia mediocria, orbicularia, disco nigro, nudo, margine albido, granulato-crenulatissimo, crenulis minutis, numerosis, moniliformibus, valde regulariter dispositis. Ad saxa arenacea.

Spec. orig. in herb. meo Kazani.
Gubernia Astrachan; Tauria.

Forma *pezizoidea*, Mer.

Mereschkovsky, Addit. ad lichenogr. Rossiæ, i., Oesterr. Botan. Zeitschr. 1921.

Margine thallode apotheciorum ut in forma typica at apotheciis majoribus, usque ad 3–4 millim. latis, cupuliformibus, disco atro, nudo. Ad saxa arenacea.

Spec. orig. in herb. meo Kazani.
Rossia, gubern. Astrachan.

Lecanora dispersa, forma *obscura*, Mer.

Mereschkovsky, Beitr. z. Kenntn. d. Flecht. Umgd. v. Reval, Kazan, 1909.

Apotheciis obscurioribus.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval.

Lecanora elenkinii, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos (no. 31), Kazan, 1913; id. Contrib. fl. lichén. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus tenuis, parum evolutus, lutescente-albidus; apothecia media vel submedia vel mediocria, elevata, margine concolore, tumido, discum valdè superante, involuto, disco plano vel concaviusculo.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Rossiæ exs. no. 31, (3) in ejusdem Tabulæ Generum Lichenum (1913), *Lecanora*, i. no. 29 (e Tauria).
Tauria.

Forma *albinea*, Mer.

Mereschkovsky, Contrib. fl. lichénol. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallo et margine apotheciorum albo; thallo pulverulento.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Generum Lichenum (1913), *Lecanora*, i. no. 30 (e Tauria: Sinferopolis).
Tauria. Austria meridionalis!

Lecanora gangaleoides, forma *ornata*, Mer.

Mereschkovsky, Tabulæ Generum Lichenum, Kazan, 1913, *Lecanora*, ii. no. 52 (ex Gallia, Docelles (Vosges)).

Apotheciis foliolis thallinis ornatis. Est forma potentialis (vide Hedwigia, 1919, p. 206).

Spec. orig. in herb. meo Kazani.

Forma *plumbea*, Mer.

Mereschkovsky, *l. c.* no. 53 (e Gallia, Docelles (Vosges)).

Thallo plumbeo.

Spec. orig. in herb. meo Kazani; vide etiam in Tab. Gen. Lich. no. 53.
Gallia: Docelles (Vosges).

Lecanora hageni, forma *brunneola*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora.*

Apotheciis obscurioribus, fusco-brunneolis. Ad saxa granitica. Comparanda cum *Lecanora brunneola*, Mer., in Mereschkovsky, Tabulæ Generum Lich. Kazan, 1913, *Lecanora*, i. no. 37 (ex Austria, Mönichkirchen).

Spec. orig. in herb. Conservat. botan. Genevæ.
Lugano.

Forma *microcarpa*, Mer.

Mereschkovsky, Schedulæ ad Lich. ticin. exsiccatos, Annuaire du Conservatoire et Jard. bot. d. Genève, vol. xxi. 1919, p. 165.

Apothecia minuta, sat uniformia, distantes, vulgo 0·3 millim. (0·2–0·4 millim.) lata, margine sæpius subcrenulato vel crenulato.

Spec. orig. (1) in herb. Conservat. botan. Genevæ, (2) in herb. Parisii (Muséum), (3) in herb. Brit. Mus.
Is certainly not a young state of the type.
Lugano; Geneva (Helvetia).

Forma *perplexoides*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora.*

Thallus parum evolutus, albidus, subgranulatus, hypothallo albo; apothecia media, 0·6–1 millim. (0·4–1·2 millim.) lata, concreta, mutuo pressione elevata, orbicularia vel subflexuosa, margine tenui integro, interdum leviter crenulato discum parum superante, albido; disco plano vel interdum subconvexo, pallide livido-brunneolo, nudo. Habitu nonnullum *Lecanoram perplexam*, Mer., commemorans. Ad saxa granitica.

Spec. orig. (1) in herb. Conservat. botan. Genevæ, (2) in herb. Brit. Mus.
Lugano (Helvetia italica).

Lecanora perplexa, Mer.

Syn. *Lecanora crenulata*, multor. auctorum, præcipue rossicorum.
Lecanora galactina, Harm. Lich. Lothar. no. 561.
Lecanora galactina, forma *ligniaria*, Nyl. in Norrl. et Nyl. H. L. F. no. 139 (*vide* Harmand, Lich. d. Fr. p. 1006).
Lecanora albella, var. *hageni*, in Mudd, Exsicc. no. 115.
Lecanora galactina, Ach. in Hepp. Flecht. Eur. no. 180.
Exsicc. Mereschkovsky, Licht. Ross. exsicc. no. 9 (sub *Lecanora crenulata* (Dicks.), Wain.; ejusdem Tabulæ Gen. Lich. Kazan, 1913, *Lecanora*, i. no. 21 (sub nomine vero).

Ad saxa calcarea, præsertim supra muros.
Thallus parum evolutus, e granulis paucis applanatis vel plus

minusve convexis in vicino apotheciorum dispositis compositus, vulgo obsoletus vel invisibilis, albicans vel griseo-albicans, opacus. Reactione KOH−, $CaCl_2O_2$−, $KOH(CaCl_2O_2)$−, H_2O−. Apothecia vulgo media vel majuscula, latitudine valde variabili, 0·3–3·7 millim. lata, vulgo 1–2 millim. lata, numerosissima, conferta, mutuo pressione irregulares, flexuosa, valde elevata, basin versus constricta, haud arcte adfixa et tum facile cadescentes, margine thallo concolore, mediocri, integro vel leviter irregulariterque crenulato, disco sordido brunneolo, pruinoso. Paraphyses tenues, filiformes, haud articulatæ, arcte cohærentes. Sporæ 8næ, simplices, ellipsoideæ vel ovoideo-ellipsoideæ, longitudine 0·0110–0·0138 millim., crassitudine 0·0048–0·0072 millim. (usque ad 0·0164 millim. longit. et 0·0096 millim. crassit.).

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 9, (3) in ejusdem Tab. Gen. Lich. no. 21. Rossia Media; Esthonia; Fennia; Tauria. Etiam in Anglia, Gallia, Germania et Austria occurrit.

Forma *delicata*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. a. d. Umgeg. Revals, Kazan, 1913.

Apotheciis minoribus, magis applanatis regulariterque rotundatis, haud flexuosis, basin versus minus constrictis. Ad muros calcareos et cementum earum.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Generum Lich. Kazan, 1913, *Lecanora*, i. no. 20 (e Reval).
Esthlandia: Reval. Gallia: Docelles (Vosges).

Var. *grisea*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. a. d. Umgeg. Revals, Kazan, 1913 (sub *Lecanora crenulata*, var.).

Colore griseo thalli et marginis apotheciorum constanter a typo differt. Ad saxa calcarea.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 10, (3) in ejusdem Tabulæ Gen. Lich. Kazan, 1913, *Lecanora*, i. no. 22 (e Reval).
Esthlandia: Reval.

Var. *wasmuthi*, Mer.

Mereschkovsky, Excurs. lichénol. dans les steppes Kirghises (Mont Bogdo), Kazan, 1911 (sub *Lecanora wasmuthi*, Mer.).

Colore thalli et apotheciorum sordide lutescente-brunneolo constanter a forma typica differt. Thallus KOH et $CaCl_2O_2$+.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Generum Lich. Kazan, 1913, *Lecanora*, i. no. 23 (ex gub. Astrachan).
Gubern. Astrachan. Tauria. Saxicola.

Lecanora subfusca, forma *griseola*, Mer.

Mereschkovsky, Addit. lichenogr. Ross. i., Oesterr. Botan. Zeitschr. 1921.

Thallo griseolo (in typo thallus constanter albescens), sec. specim. meo.

Spec. orig. in Malme, Lich. Succ. no. 69 (sub *Lecanora subfusca*).
Kazani. Suecia.

Forma *coilocarpoides*, Mer.

Mereschkovsky, Matér. p. une Monogr. d. genre *Lecanora.*

Thallus tenuis, albineus; apothecia dispersa, orbicularia, vulgo 0·8–1·2 millim. lata (usque ad 1·5 millim.), disco fusco-nigro, madefacto rufo-fusco, subconvexo, nudo, margine thallino mediocri, haud inflexo, crenulato.

Spec. orig. in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ subfuscæ*), (2) in herb. Brit. Mus.
Prope Genevæ.

Forma *microcarpa*, Mer., subforma *umbrinula*, Mer.

Mereschkovsky, *l. c.*

Apotheciis confertis, 0·5–1 millim. latis, convexiusculis vel convexis, umbrino-fuscis vel fusco-nigricantibus, nudis, nitidiusculis, margine tenui vel tenuissimo, griseo-cinerascente, tenuiter crenulato. Thallus et margo apotheciorum KOH + flavescens.

Spec. orig. in herb. Brit. Mus.
Lugano, supra Fagum.

Var. *brachyspora*, Mer.

Thallus tenuissimus; apothecia 0·6–1 millim. lata, margine crassiusculo, integro vel vix crenulato, disco rufo, plano, nudo; epithecium granulatum sporæ late ellipsoideæ, subsphæricæ, longitudine 10–12 m., crassitudine 9–10 m. Est *Lecanora subfusca*. var. *Pinastri anzi*, Lich. minus rari Ital. super., no. 186, descripta a Hue (Caus. s. le *Lecan. subfusca*, Bull. Soc. bot. d. Fr. 1903, p. 81) sine nomine. Verisimiliter species peculiaris est.

Var. *minor* (Oliv.), Mer., forma *decussata*, Mer.

Thallus, apothecia et sporæ ut in varietate (vide specim. a me determin. in herb. Conservat. bot. Genevæ et in herb. Brit. Mus.), at thallo lineis nigris distinctissimis decussato. Supra corticem fagi.

Spec. orig. (1) in herb. Conservat. botan. Genevæ (vide Tabulam *Lecanoræ subfuscæ*), (2) in herb. Brit. Mus.
Grand Salève, prope Genevæ.

Lecanora umbrina, forma *subbotryosa*, Mer.

Mereschkovsky, Hedwigia, 1919, p. 203; id. Matér. p. une Monogr. d. genre *Lecanora*.

Apotheciis convexis, subbotryosis. Supra corticem cerasi.

Spec. orig. in herb. Conservat. botan. Genevæ.
Lugano (Helvetia).

Aspicilia asterias, Mer.

Thallus determinatus, placas rotundas vel subrotundas formans, ambitu pseudoeffiguratas, sordide albidus vel lacteo-candidus, lævigatus, opacus, rimoso-areolatus; areolis quadrangularis vel multangulis, marginem thallinum versus in radiis regulariter dispositis, rimis dichotomice subdivisis, lobos radiantes æmulantibus. Apothecia immersa, nigra, nuda plus minusve pruinosa. In rupe calcarea.

Spec. orig. in herb. meo Kazani.
Tauria. Gallia meridionalis prope Nice.

Aspicilia cerebroides, Mer.

Thallus liberus, glebulas irregulariter rotundatas, 15–28 millim. longas et 9–20 millim. latas formans, superficie gyrosa ex areolis tumidis elongatisque hypertrophyce crescentibus, circumvolutiones cerebrales in memoriam revocantibus contextus. Intus in sectione thallus albus, haud marmoreus ut in *Aspicilia esculenta*. Apothecia non visa. Vide figura in Elenkin, Wanderflechten, in Bullet. Jard. Botan. d. St. Pétersb. t. i. tab. i. linea iv. fig. 6, 8, linea v. fig. 6, 7.

Spec. orig. (1) in Mereschkovsky, Tabulæ Generum Lichenum, Kazan, 1913, *Aspicilia*, i. (*Sphærothallia*) no. 18 (e Tian Schan); (2) in herb. meo Kazani (sub *Aspicilia alpicola*).

Aspicilia desertorum, forma *ferruginea*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, no. 17, Kazan, 1913.

Thallus et apothecia sicut in forma typica, at colore ferrugineo thalli ab hæc differt. Saxicola. Potius lusus est.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 17, (3) in ejusdem Tabulæ Gen. Lich. *Aspicilia*, i. (*Sphærothallia*) no. 2 (e Monte Bogdo).
Gubernia Astrachan.

Forma *sublævata*, Mer.

Mereschkovsky, Excurs. lichénol. d. l. steppes Kirghises (Mont Bogdo), Kazan, 1911 (cum fig.).

Apotheciis planioribus, marginibus tenuioribus minusque elevatis, disco dense pruinoso.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Gen. Lich. Kazan, 1913, *Aspicilia*, i. (*Sphærothallia*) no. 3 (e Mons Bogdo).

The apothecia, quite Lecanorine in the type, present a more Aspicilian aspect in this form.
Gubernia Astrachan. Ad saxa argillaceo-schistosa.

Var. *aspera*, Mer.

Mereschkovsky, *l. c.* (cum fig.).

Thallus asperus, spinulis vel protuberantiis spinulosis brevibus irregularibusque plus minus instructus. Saxicola et terricola.

Spec. orig. ibidem (Tabulæ Gen. Lich. no. 6) (Mons Bogdo).
Gubernia Astrachan. Tauria. Asia Media.

Forma *hispidoides*, Mer.

Mereschkovsky, *l. c.* (cum fig.).

Thallus haud liberus, subfruticulosus, ramulis elongatis, erectis subramosis, superficie irregulariter rugoso, aliquantulum *Aspiciliam hispidam*, Mer., in memoriam revocans. Terricola et saxicola.

Spec. orig. in herb. meo Kazani.
Gubernia Astrachan. Asia Media.

Var. *incisa*, Mer.

Mereschkovsky, *l. c.* (cum fig.).

Apotheciis minoribus, immersis, crateriformibus, margine thallino acuto, inciso, sæpe fere totum discum obtecto. Forsan potius species peculiaris sit. Saxicola.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Gen. Lich. Kazan, 1913, *Aspicilia*, i. (*Sphærothallia*) no. 4.

Gubernia Astrachan. Asia Media.

Var. *nigrescens*, Mer.

Mereschkovsky, *l. c.* (cum fig.).

Thallus crustaceus, effusus, crassus, e tuberculis mastoideis, 2–3 millim. (vel plus) longis, circiter 1–2 millim. latis, confertis, contextus; nigrescens vel olivaceo-nigrescens, cyphellis albidis ornatus. Sterilis. In rupibus arenaceis.

Spec. orig. in herb. meo Kazani.

Gubernia Astrachan.

Var. *semivagans*, Mer.

Mereschkovsky, *l. c.* (cum fig.).

Thallus pro parte crustaceus, pro parte glebulos minutos formans statu libero viventes. Areolæ thalli sat similis species sed superficie paullo nitidiusculo et cyphellis magis immersis.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Gen. Lich., *Aspicilia*, i. no. 5.

Aspicilia dubia, Mer., var. *microphyllina*, Mer.

Mereschkovsky, Addit. ad Lichenogr. Ross. i., in Oesterr. Bot. Zeitschr. 1921.

Tuberculis thalli minutis.

Spec. orig. in Mereschkovsky, Tabulæ Gen. Lich. Kazan, 1913, *Aspicilia*, i. (*Sphærothallia*) no. 16 (e Tian-Schan).

The type of the species is represented in my 'Tabulæ Generum Lichenorum' by no. 15. The var. *microphyllina* (no. 16) has the tubercules one-half or one-third the size of those in the type.

Aspicilia esculenta, forma *retusa*, Mer.

Thallo minore, vulgo 10 millim. (8–15 millim.) lato, sordide griseo-albescente, squamulis minoribus, minus prominulis, retusis, passim subverrucosus. Apotheciis crateriformibus, minutis vel minutissimis punctiformisque, vulgo 0·3–0·5 millim. (0·1–1 millim.) latis, in verrucis plus minusve conicis profunde immersis, margine inciso-crenulato, disco nigro, leviter pruinoso.

Spec. orig. (1) in herb. Conservat. botan. Genevæ, (2) in Museo Botan. Univ. Genevæ, (3) in herb. Brit. Mus.
Provincia Ural.

Aspicilia fruticulosa, forma *minor*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1913, p. 14.

Thallo minore, circiter 1 centim. lato (0·8–1·6 millim.), ramulis paullulum tenuioribus, sed dense contextis ut in typo, granulis ad superficiem thalli circiter 16–20 in uno centimetro (in typo 10-14 in 1 centim.).

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Gen. Lich. Kazan, 1913, *Aspicilia*, i. (*Sphærothallia*), no. 10, (3) in herb. Conservat. botan. Genevæ.
In desertis Kirgisorum. Tauria. Asia Media (Akmolinsk).

Forma *taurica*, Mer.

Mereschkovsky, *l. c.*

Thallo minore, circiter 1–1¼ centim. lato, laxiusculo, ramis ramulisque discretis a forma typica bene differt. Semper sterilis.

Spec. orig. ibidem (Tabulæ Gen. Lich. no. 9). Etiam in Mereschkovsky, Lich. Ross. exsicc. no. 21.
Gubernia Astrachan. Tauria.

Var. *tenuatula*, Mer.

Mereschkovsky, Contrib. conn. lich. gouv. Vladimir, Troudy (Travaux), d. l. soc. d. Natur. de l'Univ. d. Kazan, 1911 ; id. Schedulæ ad Lich. R. exs. Kazan, 1913, p. 14 ; id. Contrib. fl. lich. Crimée, Ann. d. sc. nat. Botanique, 1921 (cum. fig.).

Thallus magnitudine ut in forma typica speciei, sed ramulis valde tenuioribus, confertis, granulis ad superficiem thalli circiter 18–22 in uno centimetro (in typo 10–14 in 1 centim.).

Spec. orig. (1) in herb. meo Kazani, (2) in herb. cryptog. Horti Petropolit. (sub alio nomine).
Tian-Schan.

Aspicilia hispida, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1913 (no. 34).

Thallus liberus, fruticulosus, latitudine circiter 2 centim., ramis tenuis, cylindricis, glabris, laxe ramosis, apicibus sensim attenuatis tenuisque in spinis terminatis. Semper sterilis. Supra terram statu libero.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 34.
Rossia meridio-orientalis.

Forma *cæspitosa*, Mer.

Mereschkovsky, Excurs. lichénol. d. l. steppes Kirghises (Mont Bogdo), Kazan, 1911 (cum fig.).

Thallus cæspitosus, radiculoidis ad terram adfixus.

Spec. orig. in herb. meo Kazani.
Gubernia Astrachan (Rossia).

Forma *parvula*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1903 (no. 35); id. Contrib. fl. lichén. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921 (cum fig.).

Thallo liberus, minor, irregulariter parciusque ramosus, interdum centro placas formans. Supra terram, statu libero.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 35.
Tauria.

Aspicilia lacunosa, Mer.

Mereschkovsky, Excurs. lichénol. dans les steppes Kirghises (Mont Bogdo), Troudy (Travaux), d. l. soc. d. Natur. d. l'Univ. d. Kazan.

Thallus liberus, sordide griseus, globulas irregulares parvas circiter 5 millim. in diametro, subcomplanatas vel rotundato-subangulatas formans, opacus lævis, glaber, hinc inde depressionibus lacunosis vel foveolis plus minusve profundis munitus, neque lobatus, nec areolatus, nec gyrosus ut in *Aspicilia cerebroides*, Mer. Sterilis. Supra terram statu libero.

Spec. orig. in herb. meo Kazani.
Asia Media: provincia Semipalatensk, distr. Zaisan.

Aspicilia mirabilis, Mer.

Mereschkovsky, Contrib. fl. lichénol. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus determinatus, crassiusculus, cæsio-cinereus, punctis obscuris adspersus, lævigatus, subnitidus, rimoso-areolatus, ambitu subeffiguratus, areolis quadrangulis in radiis margine versus dichotomiæ subdivisis et plus minusve in lineis concentricis regulariter dispositis. Fulcribus valde ab *Aspicilia asterias*, Mer., differt. Ad saxa calcarea (circ. 1000 m. altit.).

Spec. orig. (unicum) in herb. meo Kazani.
Tauria.

Candelaria medians, forma *sordida*, Mer.

Mereschkovsky, Contrib. fl. lichén. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus indeterminatus, valde expansus, crassiusculus, diffracto-areolatus, subverrucoso-inæqualis, griseo-luteus, sordidus, lobis obsoletis. Reactio thalli KOH—. In rupibus calcareis.

Spec. orig. in herb. meo Kazani.
Tauria.

Candelariella vitellina, var. *pulvinata*, forma *macrior*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. Umgeg. Revals, Kazan, 1913.

Granulis thalli valde majoribus quam in var. *pulvinata* typica. Ad saxa erratica.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval.

Theloschistes brevior, var. *caspicus*, Mer.

Thallus brevis, 1–1½ centim. altus, pallido carneo rufescens vel rufescens (terra concolor ?), superne glaber, opacus, subtus pallidior, albicans, haud nervosus, dichotomice laciniatus, laciniis convolutis, angustis, linearibus, convexis, circiter 1 millim. latis vel paulo majus, canaliculatis, apicibus subtruncatis. Sterilis. Supra terram argillosam.

Spec. orig. in herb. meo Kazani.
Baku, Caucasus.

Var. *halophilus*, Mer.

Thallus major et crassior quam in var. *caspico*, Mer., circiter 3–5 centim. altus vel plus, pallidus, livido-lutescens vel livido-albescens, cartilagineus, subtus concolor, nervoso-reticulatus, arbusculos ramosos formans, laciniis subdichotomice divisis et subdivisis, compressis, planis vel leviter canaliculatis, circiter 2–3 millim. latis, sublinearibus vel apicem versus paullum dilatatis, plus minusve furfuraceo-rugosis præsertim apicem versus. Semper sterilis.

Spec. orig. in herb. meo Kazani.
Gubernia Astrachan. Asia Media (Djungaria).

Xanthoria parietina, var. *adpressa*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1913; vide etiam Hedwigia, 1919, p. 209.

Thallus rosulas usque ad 1 decim. formans, tenuior ut in typo, arcte ad substratum adpressus, lobis vulgo paullulum angustioribus. Ad corticem arborum.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exs. no. 40.
Rossia Media. Esthlandia. Tauria. Gallia. Austria. Helvetia.

Var. *aureola*, forma *isidiotyla*, Mer.

Thallus aureo-aurantiacus, centro minuto papillato-isidiosus; apothecia magna, margine isidiis brevibus ornato. Ad trabes.

Spec. orig. in herb. Conservat. botan. Genevæ (a Léveillé in Tauria lectum).
Tauria.
It is possibly the same as the var. *isidioidea* (Belts.), Zahlbr., which, however, cannot be ascertained without a comparison with the original specimen of the latter.

The following is a list of all known European forms of *Xanthoria parietina*:—

1. *Xanthoria parietina* (L.), Th. Fr., type.
2. —— ——, forma *aurata* (Mass.), Lich. ital. exs. no. 33.
3. —— ——, forma *chlorina* (Chev.), Oliv. Mereschk. Lich. tic. exs. no. 83.
4. —— ——, forma *cinerascens* (Leight.), Sandst. Crombie Brit. Lich. i. p. 298.
5. —— ——, forma *dispersa*, Oliv. Bull. Soc. bot. d. Fr. 1894, p. 94.
6. —— ——, forma *imbricata* (Mass.), Zahbr. Crypt. exs. no. 1979.

7. *Xanthoria parietina*, forma *nodulosa* (Floerk.), Hillm. Ann. Mycol. 1920, p. 15.
8. —— ——, forma *pycnocarpa* (Müll. Arg.), Mer. in herb. Boissier Genevæ.
9. —— ——, var. *adpressa*, Mer. Lich. Ross. exs. no. 42.
10. —— ——, var. *angusta*, B. d. Lesd., Mereschkovsky, Lich. Ross. exs. no. 41.
11. —— ——, var. *aureola* (Ach.), Th. Fr., Mereschkovsky, Lich. Ross. exs. no. 40.
12. —— —— ——, forma *congranulata* (Cromb.), Brit. Lich. p. 298.
13. —— —— ——, forma *isidiotyla*, Mer., *vide supra.*
14. —— —— ——, forma *tumida* (Wedd.), Hillm. Boistel, ii. p. 70.
15. —— ——, var. *coralloides* (Flot.), Hillm. *l. c.* p. 19.
16. —— ——, var. *ectanea*, Molbr. et auct. (haud Ach.).
17. —— —— ——, forma *ectaneoides* (Nyl.), Oliv. Zahlbruckner Patag. p. 50.
18. —— ——, var. *elegantissima*, Zahlbr. Denkschr. Ak. Wiss. Wien, 1915, p. 39.
19. —— ——, var. *microphylla*, Zahlbr. Fl. Dalm. vii. 1919.
20. —— ——, var. *prolifera* (Humb.).
21. —— ——, var. *retirugosa*, Stnr. apud Zahlbr. Fl. Dalm. ii. 1903, p. 333.
22. —— ——, var. *rutilans* (Ach.), Synops. p. 210.
23. —— ——, var. *splendidula*, Zahlbr. Transbaik. Lich. 1909.

Xanthoria substellaris, forma *lychneoides*, Mer.

Mereschkovsky, Contrib fl. lichénol. d. l. Crimée, Hedwigia, 1919, p. 210.

Thallus lobis brevibus, adscendentibus vel subadscendentibus, confertis ad oras arcte sorediatis; apothecia plana, disco thalli intensius colorato, aurantiaco vel fulvescente-aurantiaco, margine sæpe sorediato.

Spec. orig. in herb. meo Kazani; spec. a me determin. in herb. Conservat. botan. Genevæ.
Kazan, Helvetia.

Gasparrinia aurantia, var. *brevilobata*, forma *illobata*, Mer.

Thallo, apotheciis et sporis ut in var. *brevilobata*, Nyl., sed lobis periphericis omnino constanterque destituto.

Over twenty good specimens of this form will be found in my collections in Kazan, prepared for my 'Tabulæ Generum Lichenum.'
Spec. orig. in herb. meo Kazani.
Pyren.-Orient. prope Port Vendres, Collioure (Gallia), ad saxa micaceo-schistoso.

Var. *papillata*, Mer.

Mereschkovsky, Contrib. fl. lichénol. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus papillis elongatis cylindricis vel subcylindricis obtectus.

Spec. orig. in herb. meo Kazani.
Tauria.

Gasparrinia callopisma, forma *dispersa*, Mer.

Thallo e fragmentis loborum dispersis discretisque, rosulas haud formantibus composito.

I have seen several rocks, about ½–¾ metr. in height, entirely covered with this form in an apparently healthy state, without any trace of the type-species, which, however, occurred in the vicinity.

Over twenty good specimens of this form will be found in my collections in Kazan, prepared for my 'Tabulæ Generum Lichenum.'

Spec. orig. in herb. meo Kazani.
Beaulieu, prope Nice (Gallia), 300 m. altit. Ad saxa calcarea jurassica.

Forma *purpurea*, Mer.

Mereschkovsky, *l. c.*

Thallo colore purpuraceo-aurantiaco a forma typica differt.

Spec. orig. ibidem.
Tauria. Italia (Capri).

Gasparrinia cirrochroa, forma *roseola*, Mer.

Mereschkovsky, *l. c.*

Thallo colore plus minusve roseolo et lobis paullulum latioribus et magis applanatis a forma typica differt.

Spec orig. (1) in herb. meo Kazani, (2) in herb. Conservat. botan. Genevæ (specim. a me determin.), (3) in herb. Brit. Mus.
Tauria. Lugano (Helvetia italica).

Forma *subleprosa*, Mer.

Mereschkovsky, *l. c.*

Thallo pro maxime parte in crusta leprosa dissoluto.

Spec. orig. (numeros.) ibidem.
Tauria. Lugano (Helvetia italica).

Gasparrinia decipiens, forma *fulva*, Mer.

Mereschkovsky, Contrib. fl. lichénol d. envir. d. Kazan, Hedwigia, 1919, p. 212.

Colore thalli aurantiaco vel rubigineo-aurantiaco distincte a typo differt. Ad trabes et ligna artefacta.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media (Kazan).

Forma *gracilior*, Mer.

Mereschkovsky, *l. c.*

Thallo lobis gracilioribus a forma typica bene differt. In lateribus.

Spec. orig. (numeros.) ibidem.
Rossia (Kazan).

Gasparrinia flava, Mer.

Thallus citrino-flavus (colore ut in *Gasparrinia decipiente* vel sub simile), KOH+, esorediosus, rosulas regulares formans, lobis bene evolutis, radiantibus, adpressis, planiusculis, concretis; apothecia concoloria, bimarginata. Comparanda cum *Gasparrinia aurantia*, forma *sulphurata* (Harm.), Mer. (Harmand, Lich. d. Fr. p. 810).

Spec. orig. in herb. meo Kazani.
Tauria, prope Sinferopolin, ad saxa calcarea nummulitica.

Gasparrinia granulosa, var. *perminuta*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exsiccatos, Kazan, 1913.

Thallus minutus, fulvo-aurantiacus, granulosus (ut in forma typica), rosulas minutas 2-4 millim. latas formans, sæpe confluentes et tum thallus diffusus; lobis tenuissimis, oculo nudo invisibilibus. Semper sterilis. Ad saxa calcarea.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. ticin. no. 63.
Tauria.

Gasparrinia jailensis, Mer.

Thallus aurantiacus, parte centrali diffracto-areolato, areolis subeffiguratis vel effiguratis, lobis periphericis parum evolutis.

Spec. orig. in herb. meo Kazani.
Having left all my collections and notes in Russia, I am unable to give a more detailed diagnosis of this species here.

Gasparrinia murorum, forma *albula*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. a. d. Umgeg. Revals, Kazan, 1913.

Thallo albulo vel hinc inde levissime flavescente. Ad saxa calcarea.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval. Germania.

Forma *pulvinulum*, Mer.

Thallus orbicularis, crassus, centro valde elevatus, pulvinulas formans, sporis angustis sunt in var. *tenuispora*, Mer.

Over twenty good specimens of this form will be found in my collections in Kazan, prepared for my 'Tabulæ Generum Lichenum.'
Spec. orig. in herb. meo Kazani.
Soemmering: Adlitzgraben (Austria), in rupibus calcareis.
Growing at a short distance from var. *tenuispora*, into which it gradually passes.

Var. *tenuispora*, Mer.

Thallus crassitudine configuratione, colore, etc., ut in typo speciei sed sporis angustis, subcylindricis, crassitudine circiter 0·004–0·005 millim. (in typo 0·006–0·007 millim.).

Over twenty good specimens of this variety will be found in my collections in Kazan, prepared for my 'Tabulæ Generum Lichenum.'
Spec. orig. in herb. meo Kazani.
Soemmering: Adlitzgraben (Austria), in rupibus calcareis.

Var. *subfulva*, Mer.

Mereschkovsky, Contrib. fl. lich. d. l. Crimée, Ann. d. sc. nat. Botanique, 1921.

Thallus fulvo-aurantiacus, centro vulgo pallidiore et sæpe partim cinerascente; apothecia intensior coloratæ, sæpe convexa, immarginata. Differentia minima, sed constantissima esse videtur.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Tabulæ Gen. Lich., *Gasparrinia*, i. no. 77 (exist. only in Mus. bot. Acad. of Sc. of Petrograd and in the herb. Horti Petropolitani).
Esthlandia: Reval. Tauria.
The observation of a great number of specimens of the type (Reval) and of the variety (Crimea) in natural conditions, sometimes growing side by side, has shown the latter to be

a very constant form, constituting rather a variety than a form.

Caloplaca cerina (Ehrh.), Zahlbr., var. *holocarpa*, forma *fulva*, Mer.

Mereschkovsky, Contrib. fl. lich. envir. Kazan, Hedwigia, 1919, p. 214.

Apotheciis fulvis a forma typica varietatis holocarpæ differt. Ad ligna.

Spec. orig. in herb. meo Kazani.
Kazan.

Cladonia alpestris, forma *tenella*, Mer.

Mereschkovsky, *l. c.* p. 215.

Podetiis minoribus tenuioribusque, haud colore thalli a forma typica differt.

Spec. orig. in herb. meo Kazani.
Kazan.

Cladonia cornuta, forma *fuscata*, Mer.

Mereschkovsky, Addit. ad Lichenogr. Ross. i., Oesterr. Bot. Zeitschr. 1921.

Podetiis fuscescentibus vel fusco-rufescentibus.

Spec. orig. in herb. meo Kazani.
Sibiria: Tomsk.

Cladonia fimbriata, forma *crustulosa*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. aus d. Umgeg. Revals, Kazan, 1913, p. 40.

Thallus foliis erectis, densissime confertis, crustam compactam diffractam formans. Podetia abbreviata, scyphifera. Ad truncos arborum frondosarum basin versus.

Spec. orig. (numeros.) in herb. meo Kazani.
Esthlandia: Reval.

Var. *arboricola*, Mer.

Mereschkovsky, *l. c.*

Podetiis paucis, minutis vel minutissimis, cylindricis, scyphiferis, scyphis angustis, minutis, parum evolutis, margine scyphorum integro. Ad truncos arborum (quercus) usque ad 3 metr. altitudine et ultra, haud et basin etiam supra ramos transiens. Comparanda cum forma *tenuipes* (Del.), Malbr.

Spec. orig. (numerosissim.) ibidem.
Esthlandia: Reval.

Cladonia floerkeana, var. *carcata*, forma *deflexa*, Mer.

"Podetiis albido-cinerascentibus, densissime granuloso-isidiosis vel minute granuloso-squamulosis.—Etiam Olivier, Herb. Lich. de l'Orne (1880), no. 254, teste Arnold, Flora, 1884, p. 81, huc pertinet." Wainio, Monogr. Clad. i. p. 83.—Est Norrl. et Nyland, Herb. Lich. Fenn. no. 444 (t. Wainio).

Fennia.

Cladonia furcata, var. *pinnata*, forma *tenuior*, Mer.

Mereschkovsky, Nachtr. z. Flechtenl. Umgeg. Revals, Kazan, 1913.

Podetiis minoribus et tenuioribus.

Spec. orig. in herb. meo Kazani.
Esthlandia: Reval.

Cladonia rangiferina, forma *cærulea*, Mer.

Mereschkovsky, Contrib. fl. lichén. envir. Kazan, Hedwigia, 1919, p. 217.

Thallus cæspites subsphæricas formans. Colore podetiorum cærulescente et omnibus partibus tenuioribus et minoribus a forma typica bene differt; apicibus ramorum ut in typo unilateraliter vergentibus. Supra terram.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media (Kazan).

Forma *denudata*, Mer.

Mereschkovsky, *l. c.* p. 218.

Ramis ramulis parcis præcipueque parte inferiori denudatis a forma typica differt; colore podetiorum ut in typo.

Spec. orig. in herb. meo Kazani.
Belgia.

Forma *intricata*, Mer.

Mereschkovsky, *l. c.* p. 217.

Ramulis superioribus tenuioribus, densioribus et subintricatis a forma typica distincte differt. Colore podetiorum ut in typo, normalis.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Forma *subarbuscula*, Mer.

Mereschkovsky, *l. c.* p. 218.

Ramulis lateralibus modo subverticillato ad ramos primarios dispositis a forma typica differt. Colore podetiorum normalis.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Var. *albinea*, Mer.

Mereschkovsky, *l. c.* p. 218; etiam Addit. Lich. Ross. i., Oesterr. Bot. Zeitschr. 1921.

Colóre podetiorum albineo vel albo et crassitudine majore constanter a typo valde differt. Forma polaris esse videtur.

Spec. orig. in herb. meo Kazani.
Gubern. Archangelsk (Rossia). Sibiria (Tomsk).

Physcia farrea, forma *delabrata*, Mer.

Mereschkovsky, Contrib. fl. lich. envir. Kazan, Hedwigia, 1919, p. 222.

Thallo pallidiore, laxiusculo, laciniis longioribus, minus fornicatis, passim subpalmate divisis. Ad basin truncorum arborum frondosarum (*Betulæ albæ*).

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media (Kazan).

Forma *furfurascens*, Mer.

Mereschkovsky, *l. c.* p. 223.

Thallus minor, obscurior, fusco-nigricans, sæpe rosulas 1½–3 centim. latis formans, laciniis brevioribus, magis congestibus, margine passim parce furfurascentibus. Ad truncos arborum frondosarum.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Physcia labrata, Mer., var. *capitulata*, Mer.

Mereschkovsky, *l. c.* p. 224.

Thallus indeterminatus, valde extensus, rosulas haud formans (aut forsan statu juvenili), viresconte griseus, madefactus læte viridis (H_2O+), e laciniis brevibus subincurvatis, apice terram versus spectantibus, apicibus recurvis. Laciniæ apice capitulato-sorediosæ, sorediis viridis, capitulas majusculos elevatas, sphærico-inflatas, circiter 1–2 millim. latas formantibus. Sterilis. Ad truncos arborum frondosarum, præcipue betulæ.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Var. *detrita*, forma *albescens*, Mer.

Mereschkovsky, *l. c.* p. 224.

Thallo sordide albescente vel griseo-albescente. Ad sæpimenta.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Forma *nigrescens*, Mer.

Mereschkovsky, *l. c.*

Thallo obscuro cinereo-nigrescente vel nigrescente; apothecia parva, disco nigro, nudo, margine integro. Ad sæpimenta.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

In order to make the distinction between the two allied species—*Physcia labrata*, Mer., and *Physcia virella* (Ach.), Mer.—more clear, I give here two figures showing the peripheral lobes, and below a longitudinal section along a lobe. The darkened parts represent the sorals, being superficial in *Ph. virella* and terminal or lateral in *Ph. labrata*.

Fig. 1.

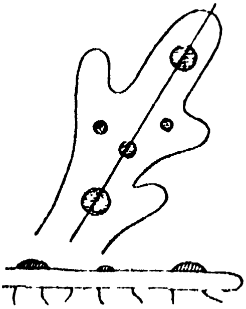

Fig. 2.

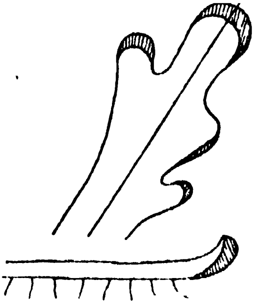

Fig. 1.—*Physcia virella* (Ach.), Mer.
Fig. 2.—*Physcia labrata*, Mer.

Physcia obscura, forma *dispersa*, Mer.

Mereschkovsky, Contrib. fl. lichénol. d. envir. d. Kazan, Hedwigia, 1919, p. 226.

Thallo cinereo, sicut in forma typica, sæpe valde extenso, laciniis brevibus, sparsis, rosulas haud formans, sorediis destituto; apothecia mediocria vel sat parva, disco fusco-nigricante, nudo, margine integro. Ad corticem lævigatam præcipue tiliæ (etiam populi juven.).

Spec. orig. (numerosissim.) in herb. meo Kazani.
Rossia Media (Kazan).

Physcia pulverulenta, forma *granulosa*, Mer.

Mereschkovsky, *l. c.* p. 227.

Thallus epruinosus, griseus vel subglaucescente- vel olivascente-griseus, lobis latis concretisque ut in typo, superne granulis elevatis nudis plus minusve numerosis obtectus; apothecia vulgo passim parce foliolis thallinis munito.

Spec. orig. (numerosissim.) in herb. meo Kazani.
Rossia Media (Kazan). Esthlandia.

Subforma *fruticulosa*, Mer.

Mereschkovsky, *l. c.* p. 228.

Thallus erectus vel subdecumbens, fruticulosus, e ramulis elongatis, teretiusculis, pro parte e granulis evolutis, laxe subramosis, consistens; lobis adpressis quasi destitutus. In rimis corticis arborum frondosarum, locis umbrosis.

Spec. orig. ibidem.
Rossia Media (Kazan).

Forma *rugosa*, Mer.

Mereschkovsky, *l. c.* p. 229.

Thallus colore et forma laciniarum ut in typo vel interdum subfuscescens vel cervino- vel cinereo-olivaceo-rufescens vel cinereo-subfuscescens, leviter pruinosus vel nudus; apothecia margine crasso, irregulariter rugoso- vel granuloso-crenulato.

Spec. orig. (numerosissim.) (1) ibidem, (2) in herb. Conservat. botan. Genevæ (specim. a me determin.).
Rossia Media (Kazan). Helvetia.

Forma *venustoides*, Mer.

Mereschkovsky, Nachtrag z. Flechtenliste a. d. Umgeg. Revals, Kazan, 1913.

Thallus nudus, brunneo-rufescens vel rufescens vel cinereo-brunneus, laciniis latis concretisque ut in typo; apothecia margine integro ut in typo, sed foliolis thallinis passim parce ornato.

Spec. orig. (numerosissim.) in herb. meo Kazani.
Rossia Media (Kazan). Esthlandia.

Var. *angustata*, forma *nuda*, Mer.

Mereschkovsky, Schedulæ ad Lich. ticin. exsiccatos, in Annuaire du Conservat. et Jard. bot. d. Genève, vol. xxi. 1919, p. 192.

Thallo fusco, nudo vel hinc inde leviter pruinoso.

Spec. orig. (1) in herb. meo Kazani (numeros.), (2) in herb. Conservat. botan. Genevæ, (3) in Mereschkovsky, Lich. ticin. exs. no. 70.
Rossia. Helvetia.

Var. *argyphæa*, forma *centrofusca*, Mer.

Mereschkovsky, Schedulæ ad Lich. Ross. exs. Kazan, 1913 (no. 50); Hedwigia, 1919, p. 230.

Thallus albo-suffusus, centrum versus sordide griseo-fuscescens, epruinosus, laciniis interdum leviter angustioribus; apothecia ut in var. *argyphæa*.

Spec. orig. (1) in herb. meo Kazani, (2) in Mereschkovsky, Lich. Ross. exsicc. no. 50.
Rossia Media (Kazan).

Forma *granulata*, Mer.

Mereschkovsky, Contrib. fl. lichénol. envir. Kazan, Hedwigia, 1919, p. 231.

Thallus albo-pruinosus, granuloso-diffractus, laciniis periphericis vix ullis vel brevissimis.

Spec. orig. (numeros.) (1) in herb. meo Kazani, (2) in herb. Conservat. botan. Genevæ.
Rossia. Helvetia.

Var. *imbricata*, forma *microphyllina*, Mer.

Mereschkovsky, *l. c.*

Laciniis brevioribus angustioribusque, minus quam 1 millim. latis.

Spec. orig. in herb. meo Kazani.
Rossia Media (Kazan).

Var. *rufescens*, Mer.

Mereschkovsky, *l. c.*

Thallus brunneus, fuscus vel rufo-fuscus; apothecia disco plus minusve pruinoso, marginibus thallinis destitutis in quid a var. *venusta* differt. Forsan est melius forma consideranda.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media (Kazan).

Physcia stellaris, forma *albo-granulosa*, Mer.

Mereschkovsky, Contrib. connaiss. lich. gouv. Vladimir, Troudy (Travaux), d. l. soc. d. Natur. d. l'Univ. d. Kazan, 1911; id. Contrib. fl. lich. Kazan, Hedwigia, 1919, p. 232.

Thallus albus, granuloso-inæqualis præcipue centrum versus.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media. Esthlandia: Reval.

Physcia tribacia, var. *labrosa*, Mer.

Mereschkovsky, Contrib. fl. lichén. envir. Kazan, Hedwigia, 1919, p 234.

Thallo griseo-virescente, laciniis magis erectis, irregulariter subconfertis, labroso-sorediatis a typo valde differt. Forsan ad *Physciam labratam* pertinet. Ad corticem arborum.

Spec. orig. (numeros.) in herb. meo Kazani.
Rossia Media. Esthlandia: Reval.

Physcia virella, var. *setosoides*, Mer.

Mereschkovsky, *l. c.* p. 236.

Thallus cinereo-virescens, rosulas sæpe confluentes formans, sorediosus, sorediis viridis; laciniæ ciliis marginalibus plus minus numerosis, bene visibilibus modo *Physciæ setosæ* munitæ. Sterilis. Ad corticam tiliæ.

Spec. orig. (numeros.) ibidem.
Rossia Media (Kazan).

Rhizocarpon geographicum, var. *microareolata*, Mer.

Thallus intense flavescens, areolis minutissimis, circiter 0·4 0·5 millim. latis (vel minor), confertis, planis; apotheciis minutis inter areolis immixis.

Spec. orig. in herb. meo Kazani.
Austria Inferior (Mönichkirchen)*.

Verrucaria calciseda, forma *roseola*, Mer.

"Thallo roseolo."

Spec. orig. (numeros.) in herb. meo Kazani.
Austria Inferior (Wiener Wald).

Numerous new forms of *Graphis scripta*, with Latin diagnoses, have been or are to be described by the author in his

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* Without my notes, left in Russia, I am not quite sure of the locality: it is either Austria or Gallia meridionalis.

paper, "Matériaux pour une Monographie du Genre *Graphis*," in 'Annuaire du Conservatoire et Jardin botanique de Genève,' vol. xxi. 1921. Another set of new species, varieties, and forms of different kinds of lichens, also accompanied with Latin diagnoses, can be found in my paper "Schedulæ ad Lichenes ticinenses exsiccatos" in the same 'Annuaire du Conservatoire botan. &c.,' vol. xxi. 1919, pp. 145–216.

In my previous paper in this Magazine, "On some new Forms of Lichens" (Ann. & Mag. Nat. Hist. ser. 8, vol. vi. p. 482, Nov. 1920), the two following should be added to the list of forms belonging to *Physcia pulverulenta* (pp. 484–485) :—forma *nigricans*, Müll. Arg. (Classif. p. 35 ; Flagey, Lich. d. l. Franche-Comté, i. p. 182), and forma *nuda*, Harm. (Lich. d. Fr. p. 634).

CORRECTION.

While my paper "On some new Forms of Lichens," recently published in this Magazine (vol. vi. 1920, p. 482), was in the press, I sent to the editors two supplementary forms to be added to those belonging to the species *Physcia pulverulenta* (*l. c.* p. 484), of which one—forma *nigricans*, Müll. Arg.—has been erroneously put as a form of the var. *angustata*, to which it does not belong, being a form of the species itself, while the other—forma *nuda*, Herm.—has been omitted altogether.

After correcting these errors and adding another form which I previously omitted (forma *deminuta*, Cromb.), the list of forms belonging to *Physcia pulverulenta* will now read as follows :—

1. *Physcia pulverulenta* (Schreb.), Nyl.
2. —— ——, forma *delicata*, Mer.
3. —— ——, forma *deminuta*, Cromb. Brit. Lich. i. p. 308.
4. —— ——, forma *granulosa*, Mer. (Hedw. 1919, p. 227).
5. —— —— ——, subforma *fruticulosa*, Mer. (Hedw. 1919, p. 228).
6. —— ——, forma *nigricans*, Müll. Arg. (Classif. p. 35).
7. —— ——, forma *nuda*, Harm. Lich. d. Fr. p. 634.
8. —— ——, forma *polita*, Flot.
9. —— ——, forma *rugosa*, Mer. (Hedw. 1919, p. 229).
10. —— ——, forma *subvenusta* (Nyl.).
11. —— ——, forma *turgida* (Schaer.), Harm.
12. —— ——, forma *turgidula*, Mer.
13. —— ——, forma *venustoides*, Mer. (Hedw. 1919, p. 229).
14. —— ——, var. *angustata* (Hoffm.), Ach.
15. —— —— ——, forma *convexa*, Mer.
16. —— —— ——, forma *elegantella*, Mer.
17. —— —— ——, forma *nuda*, Mer. (Hedw. 1919, p. 230).
18. —— ——, var. *aquiloides*, Mer.

19. *Physcia pulverulenta*, var. *argyphæa*, Ach.
20. —— —— ——, forma *centrofusca*, Mer. (Hedw. 1919, p. 230).
21. —— —— ——, forma *granulata*, Mer. (Hedw. 1919, p. 231).
22. —— ——, var. *imbricata*, B. de Lesd.
23. —— —— ——, forma *microphyllina*, Mer. (Hedw. 1919, p. 231).
24. —— ——, var. *lepidota*, Mer.
25. —— ——, var. *rufescens*, Mer. (Hedw. 1919, p. 231).
26. —— ——, var. *subpapillosa*, Cromb. Brit. Lich. i.
27. —— ——, var. *venusta* (Ach.).

On page 484 of the above-mentioned paper the name *Physcia pulverulenta* placed before forma *elegantella*, Mer., must be deleted, this form belonging to the var. *angustata*, and not to the species itself.

On page 485, line 9 from the bottom, for "minoribus" read "tenuioribus."

APPENDIX.

'*Lichenes Rossiæ exsiccati.*' Edited by Prof. Dr. C. MERESCHKOVSKY. Kazan, 1913. Fasciculi I.–III.

This exsiccata work, of which Harmand wrote to me "je le trouve idéal sous tous les rapports," is very little known. It cannot be purchased now; but, when the Jewish domination in Russia is over and order established, those who want to acquire it are requested to apply to Dr. John Briquet, Director of the Botanical Garden in Geneva (Switzerland), to whom I have transferred my rights in this work.

The three fascicules that have already appeared contain the following species *:—

Fasciculus I.

1. *Ramalina fraxinea*, var. *calicariformis.*
2. —— *populina.*
3. —— *polymorpha.*
4. *Parmelia prolixa.*
5. —— *tubulosa.*
6. —— *ryssolea.*
7. —— *taurica*, sp. n.
8. *Lecanora tristis*, sp. n.
9. —— *perplexa*, sp. n.†.
10. —— ——, var. *grisea*, nov.
11. —— *crenulata* †.

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* I am introducing some necessary corrections into this list, viz.:—

No. 9. *Lecanora perplexa*, sp. n., instead of *L. crenulata.*
No. 11. *Lecanora crenulata*, instead of *L. cæsioalba.*
No. 36. *Lecanora carpinea*, which is the right name of *L. angulosa.*
No. 59. *Parmelia caperata*, which is the right name of *P. cylisphora.*

† This name must be put in place of the old one.

12. *Squamaria muralis*, forma *albomarginata*.
13. —— ——, var. *diffracta*.
14. —— ——, var. *brunneola*, nov.
15. *Aspicilia cinerea*, forma *dendritica*, nov.
16. —— *desertorum*.
17. —— ——, forma *ferruginea*, nov.
18. —— *esculenta*.
19. —— *affinis*.
20. —— *fruticulosa*.
21. —— ——, forma *taurica*, nov.
22. *Caloplaca brachyspora*, sp. n.
23. —— (*Pyrenodesmia*) *chalibæa*.
24. *Xanthoria lobulata*.
25. *Lepraria flava*.

Fasciculus II.

26. *Ramalina fraxinea*.
27. *Parmelia isidiotyla*.
28. *Evernia thamnodes*.
29. *Lecanora umbrina*, var. *cæsio-pruinosa*.
30. —— *subcarnea*.
31. —— *elenkinii*, sp. n.
32. —— *dispersa*.
33. —— *glaucella*, var. *nigrescens*.
34. *Aspicilia hispida*, sp. n.
35. —— ——, forma *parvula*, nov.
36. *Lecanora carpinea* (syn. *angulosa*).
37. *Candelaria concolor*, var. *granulosa*.
38. *Candelariella cerinella*, var. *unilocularis*.
39. *Stereocaulon paschale*.
40. *X. parietina*, var. *aureola*.
41. —— ——, var. *angusta*.
42. —— ——, var. *adpressa*, nov.
43. *Caloplaca cerina*.
44. —— ——, var. *holocarpa*.
45. *Gasparrinia decipiens*.
46. —— *murorum*.
47. —— ——, var. *scopularis*.
48. *Physcia pulverulenta*.
49. —— ——, var. *argyphæa*.
50. —— —— ——, forma *centrofusca*, nov.

Fasciculus III.

51. *Umbilicaria pustulata*.
52. *Usnea florida*, forma *humilis*.
53. —— ——, var. *hirta*, forma *minutissima*, no
54. *Parmelia centrifuga*.
55. —— *conspersa*.
56. —— *vagans*.
57. —— ——, var. *desertorum*.
58. —— —— ——, forma *elegans*, nov.
59. —— *caperata* (Hoffm.), Nyl.
60. *Lecanora atra*, var. *urceolata*, nov.
61. *A. cinerea*.
62. *Xanthoria polycarpa*.
63. *Gasparrinia granulosa*, var. *perminuta*, nov.

64. *Cladonia sylvatica.*
65. —— *alpestris.*
66. —— *rangiferina.*
67. —— *verticillata.*
68. —— *turgida.*
69. *Buellia epipolia.*
70. *Physcia tribacia.*
71. —— *virella.*
72. —— ——, forma *georgiensis.*
73. *Graphis scripta*, var. *pulverulenta.*
74. *Arthopyrenia rhyponta.*
75. *Lepraria cinereo-sulphurea.*

My collections in Kazan contain material for ten more fascicules. It is hoped that some lichenologist will undertake the continuation of this work after my death.

'*Tabulæ Generum Lichenum.*'

Edited by Prof. Dr. C. MERESCHKOVSKY.

This work is still less known than the previous one. Only five tabulæ have been issued, but material exists, gathered during my travels through the whole of Europe, for about thirty-five tabulæ.

The tabulæ that have already appeared—they can also be obtained later on through Dr. J. Briquet, Geneva—include the following genera:—

Lecanora, I., II., and III.
Aspicilia, I. (*Sphærothallia*).
Gasparrinia, I.

These have been acquired by (1) the Academy of Science of Petrograd, (2) Hortus botanicus petropolitanus, (3) University of Kazan.

I give here the contents of these five tabulæ, and add the localities (which they do not contain) as far as I can remember, all my notes having been left in Russia:—

ASPICILIA I. (Sphærothallia).

1. *Aspicilia desertorum* (Kremplh.), Mer. Bogdo in gubernia Astrachan (Rossia).
2. —— ——, forma *ferruginea*, Mer. Ibidem.
3. —— ——, forma *sublævata*, Mer. Ibidem.
4. —— ——, var. *incisa*, Mer. Pr. p. ibidem, pr. p. Provincia Syr. Darja, prope locum Kyzil-Khul (Rossia).
5. —— —— *semivagans*, Mer. Tauria: Ai Petri (Rossia).
6. —— ——, var. *aspera*, Mer. Bogdo in gubernia Astrachan (Rossia).
7. —— *esculenta* (Eversm.), Mer. Ibidem.

8. *Aspicilia fruticulosa* (Eversm.), Mer. Ibidem.
9. —— ——, forma *taurica*, Mer. Tauria prope Sinferopolin (Rossia).
10. —— ——, forma *minor*, Mer. Tauria, prope Sinferopolin; C. Akmolinsk in Asia Media (Rossia).
11. —— *affinis* (Eversm.), Mer. Bogde in gubernia Astrachan (Rossia).
12. —— ——, var. *intermedia*, Mer. Akmolinsk in Asia Media (Rossia).
13. —— *hispida*, Mer. Bogdo in gubernia Astrachan (Rossia).
14. —— ——, forma *parvula*, Mer. Tauria, prope Sinferopolin (Rossia).
15. —— *dubia*, Mer. Tian-Schan, Asia Media (Rossia).
16. —— ——, var. *microphyllina*, Mer. Ibidem.
17. —— ——, var. *fruticuloso-foliacea* (Elenk.), Mer. Ibidem.
18. —— *cerebroides*, Mer.*. Turkestan, prope Kaschgaria (Rossia).
19. —— *jussufii* (Link), Mer. Algeria.

LECANORA (sp. Saxicolæ), I.

20. *Lecanora perplexa*, Mer., forma *delicata*, Mer. Reval (Rossia)?, vel Docelles, Vosges (Gallia).
21. —— ——, Mer. Reval (Rossia).
22. —— ——, var. *grisea*, Mer. Ibidem.
23. —— *wasmuthi*, Mer. Bogdo in gubernia Astrachan (Rossia).
24. —— *tristis*, Mer. Kazan (Rossia).
25. —— ——, forma *obscurata*, Mer. Ibidem.
26. —— *albescens*, var. *dispersa* (Nyl.), Mer. Collioure, Pyren.-Orient. (Gallia).
27. —— *crenulata* (Dicks.), Wain. Tauria, prope Sinferopolin (Rossia).
28. —— ——, forma *dispersa*, Flot. Soemmering: Adlitzgraben (Austria).
29. —— *elenkinii*, Mer. Tauria: Monasterium St. Georgii (Rossia).
30. —— ——, forma *albinea*, Mer. Tauria, prope Sinferopolin (Rossia).
31. —— *albescens* (Koffm.), Th. Fr. Reval (Rossia).
32. —— ——, forma *confertiuscula*, Mer. Ibidem.
33. —— ——, forma *granulosa*, Mer. Ibidem.
34. —— ——, var. *deminuta* (Stenh.), Th. Fr. Ibidem.
35. —— ——, var. *monsauri* (Mass.), Mer. Tauria: Chersones (Rossia).
36. —— ——, var. *dispersa*, forma *aggregata*, Mer. Collioure, Pyren.-Orient. (Gallia).
37. —— *brunneola*, Mer. Monichkirchen (Austria).

LECANORA (sp. Saxicolæ), II.

38. *Lecanora campestris*, var. *docellina*, Mer. Docelles, Vosges (Gallia).
39. —— —— (Schrer.). Concarneau (Gallia).
40. —— ——, forma *atrata*, Nyl. Agde, Hérault (Gallia).

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* The former name, *Aspicilia alpicola*, Elenk., must be replaced by this new one.

41. *Lecanora campestris*, forma *subimmersa*, Mer. Ibidem.
42. —— ——, var. *effigurata*, Mer. Pyren., Amelies les Bains (Gallia).
43. —— *cenisea*, var. *atrynea* (Ach.), Nyl. Monte Amiata, Sienna (Italia).
44. —— ——, Ach. Wechselgebiet, Monichkirchen (Austria).
45. —— ——, var. *melacarpa*, Nyl. Monte Amiata, Sienna (Italia).
46. —— *atra*, var. *grumosa* (Pers.), Ach. Docelles, Vosges (Gallia).
47. —— ——, var. *urceolata*, Mer. Tauria: Castel (Rossia).
48. —— —— (Huds.), Ach. Tauria (Rossia), pr. p.
49. —— *gangaleoides*, Nyl. Ibidem.
50. —— *atra*, var. *calcarea*, Jatta. Capri (Italia), pr. p. Tauria.
51. —— *gangaleoides*, forma *albonigra* (Stnr.), Mer. Tauria, Castel (Rossia).
52. —— ——, forma *ornata*, Mer. Docelles, Vosges (Gallia).
53. —— ——, forma *plumbea*, Mer. Docelles, Vosges (Gallia).

LECANORA (sp. Saxicolæ), III.

54. *Lecanora polytropa*, var. *alpigena*, Schaer. Wechselgebiet, Monichkirchen (Austria).
55. —— —— (Ehrh.), Th. Fr.
56. —— ——, forma *illusoria*, Ach. Reval?, vel Monichkirchen (Austria).
57. —— ——, var. *intricata* (Schrad.), Nyl. Wechselgebiet (Austria).
58. —— —— ——, forma *robusta*, Mer. Wechselgebiet, Mönichkirchen (Austria).
59. —— *coarctata*, forma *depauperata*, Mer. Wechselgebiet, Monichkirchen (Austria).
60. —— —— (Sm.), Ach. Reval (Rossia).
61. —— ——, var. *elachista*, Ach. Ibidem.
62. —— *latzelii*, Zahlbr. Dalmatia.
63. —— *coarctata*, var. *elaschista*, forma *cotaria*, Ach. Reval (Rossia)?.
64. —— *sordida* (Pers.), Th. Fr. Wechselgebiet, Mönichkirchen, (Austria).
65. —— ——, forma *leptoplaca*, Nyl. Reval (Rossia).
66. —— ——, forma *complanata*, Leight. Wechselgebiet, Mönichkirchen (Austria).
67. —— ——, var. *sulphurata*, Ach. Tauria, Castel (Rossia).
68. —— —— ——, forma *subradiosa* (Nyl.), Mer. Pyrén., Amélie-les-Bains (Gallia).
69. —— ——, var. *swartzii* (Ach.), Mer. Docelles, Vosges (Gallia).
70. —— ——, forma *pseudosubcarnea* (Harm.), Mer. Ibidem.
71. —— *subcarnea* (Sm.), Ach. Tauria (Rossia).

GASPARRINIA I.

72. *Gasparrinia murorum* (Hoffm.), Tornab. Reval (Rossia).
73. —— ——, var. *tenuispora*, Mer. Soemmering: Adlitzgraben (Austria).
74. —— ——, var. *scopularis* (Nyl.). Reval (Rossia).
75. —— ——, var. *tenuispora*, forma *pulvinulum*, Mer. Soemmering: Adlitzgraben (Austria).
76. —— *corticicola* (Nyl.), Mer. Planta Saxicola, Reval (Rossia).

77. *Gasparrinia murorum*, var. *subfulva*, Mer. Tauria, prope Sinferopolin (Rossia).
78. —— *corticicola* (Nyl.), Mer. Planta lignicola. Astrachan (Rossia).
79. —— *murorum*, var. *miniata* (Hoffm.), Th. Fr. Gallia.
80. —— ——, var. *baumgartneri* (Zahlbr.), Mer. Austria.
81. —— *aurantia*, var. *thallincola* (Wedd.), Mer. Concarneau (Gallia).
82. —— *tegularis* (Ehrh.), Mer.[*]. Agde, Hérault (Gallia).
83. —— *aurantia*, var. *brevilobata*, forma *illobata*, Mer. Collioure, Pyren.-Orient. (Gallia).
84. —— *tenuata* (Nyl.), Mer. Beaulieu, Alp. Marit. (Gallia).
85. —— *pusilla* (Mass.), Tornab. Tauria, prope Jalta (Rossia).
86. —— *aurantia* (Pers.), Syd. Tauria, Castel (Rossia).
87. —— ——, forma *centrifuga* (Mass.), Mer. Capri (Italia).
88. —— ——, forma *mesoleuca* (Mass.), Mer[†]. Beaulieu, Alp. Marit. (Gallia).
89. —— ——, var. *brevilobata* (Nyl.), Mer. Collioure, Pyren.-Orient. (Gallia).

XXVII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XLIII. By Prof. M'INTOSH, M.D., LL.D., D.Sc., F.R.S., &c.

Recent Additions to the British Marine Polychæta.

SINCE the publication of the earlier parts of the 'Monograph of the British Marine Polychæts' was commenced (nearly fifty years ago) many additions have been made, and some of these have already been described in the 'Annals and Magazine of Natural History.' Others will be indicated in the following notes.

Of the Euphrosynidæ, a post-larval form was procured by Mr. Chadwick in the surface tow-net off Port Erin in December 1905.

Anteriorly, in the microscopic preparation, the head consists of a somewhat shield-shaped lobe, broad and slightly dimpled in front, narrower behind, and with a more deeply stained clavate band along each side, at the anterior end of which is a minute dark eye. This shield-shaped region is minutely streaked and dotted, apparently from the minute cells and granules taking in the stain. On each side of this area is a tentacle, the base of which is enlarged and the tip filiform and tapering.

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[*] The former name of no. 82, *Gasparrinia lobulata* (Sommf.), had to be changed for this new one.

[†] In addition to this form, there exists undoubtedly a forma *centroleuca* (Mass.), Mer., which I have observed in Italy, distinct from the forma *mesoleuca* by the absence of concentric zones of yellow and white coloration on the thallus.

The entire *body* has a more or less circular outline, and the four pairs of feet radiate outward characteristically, the anterior pair being wide apart and directed almost straight outward, or with a slight obliquity forward, whilst the last pair is somewhat smaller and more nearly in a transverse line. Each foot consists of a setigerous process tapered toward the tip, so that it resembles a long cone with a tuft of translucent, slightly curved, simple bristles issuing from it in a fan-like manner. Each bristle has a translucent straight shaft, the curved region at the tip being finely spinous on its convex edge. Amongst these is a shorter, stouter form also curved at the tip, but smooth. Shorter and more slender bristles apparently represent the dorsal series, and, in all, these form a group at the tentacle, their tips, which are finely serrated, curving inward at the side of the head. A similar tuft occurs on the dorsum of each foot, though in the smallest (youngest) they are not visible on the two posterior feet. The curvature of these bristles may be partly due to preservation. The alimentary canal seems to go straight backward to the vent, the last portion, occupying a little less than a third of the length of the body, being more deeply stained. A median fissure separates two minute and somewhat ovoid lobes between the bases of the posterior feet.

So far as can be observed, this would seem to be the pelagic young of *Euphrosyne*, probably of *E. foliosa*, the common species of the more southern waters. The general outline, the cephalic lobes, so largely developed in the young, the ovoid anal processes, and the nature of the feet and bristles all point to this conclusion. Such young examples seem to be rare, and I am indebted to Mr. Chadwick's courtesy for the slide containing the examples.

Hab. A single example of *Chrysopetalum debile* of the family Palmyridæ was dredged on a bottom of sand and shells in Clew Bay (*Southern*).

The occurrence of a representative of a genus characteristic of the warmer seas on the west coast of Ireland indicates the richness of this remarkable region, and the possibility of further interesting discoveries yet in store for the marine zoologist. In the description of *Palmyra aurifera*, Savigny, in the 'Challenger' Annelids, *Chrysopetalum debile* is alluded to * in connection with the presence of scales.

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* Rep. Annelida, p. 55.

Of the Polynoidæ, *Lepidasthenia argus* was found in the tube of *Amphitrite edwardsi* at Plymouth (*Hodgson*). The cephalic region is reddish with a median longitudinal groove. The median tentacle is long, stout, enlarged near the filiform tip; lateral tentacles more slender and the swelling indistinct. Tentacular cirri similar to the lateral tentacles. All the foregoing are smooth with a dark band at the distal part of the enlargement, which has a belt of opaque white. The palpi are long and tapered—exceeding the tentacular cirri in length. Eyes four, anterior pair wider apart and slightly larger than the posterior. The proboscis in extrusion is a firm cylindrical organ fully a centimetre in length, with a transverse slit at the tip, guarded by about a dozen papillæ on each margin, most of them with pigmented patches. Two slightly curved horny jaws occur above and below, and when locked they are alternate. The basal region of the organ in extrusion is marked dorsally by two brown bands.

The *body* is elongate (8½ inches), and with upwards of two hundred segments, tapered a little anteriorly, and more distinctly posteriorly, where it terminates in an anus with two short cirri. In life the colour is a brown of varying degrees of intensity with a tendency to a purplish hue. The intervals between the segments have a transverse bar of dark brown, and the cirrus bearing feet have a diffused patch of the same pigment, scarcely perceptible on those carrying elytra. The ventral surface is nearly colourless, except for a median longitudinal line of red.

The scales are subcircular or, in a few, reniform; surface and margin smooth. Each has a dark brown patch immediately behind the scar and spreading inward toward the posterior border, near which is a curved streak of opaque white. Arborescent nerve-twigs are spread over the entire elytron. One example, 8½ inches long, had 67 elytra and 199 segments.

In the first foot the dorsal division is represented by a papilla, to which the spine goes. The ventral division carries thirty or more bristles, which have slender shafts and elongated spinous tips with, in some, traces of a cleft. The spinous border is directed ventrally. The ventral cirrus is long. In the typical foot the dorsal division may carry four or five long, slender, and smooth bristles. In the ventral division are three groups of bristles, an upper with long slender shafts and elongate spinous tips, a median of numerous stout bristles with shorter tips, and a ventral series with still shorter tips. All the bristles with the exception of the first two feet are bifid. The segmental papillæ are very prominent in the posterior part of the body, and the segmental organs indicated. The dorsal cirri resemble the tentacular cirri, and extend nearly to the tips of the bristles.

It is an interesting fact in the history of this genus that one species from the Antarctic seas resides in a tube formed by the branches of a coral, the tough nature of the reticulated walls of the tube thus making an efficient protection for the elongated annelid. The twigs of the coral seem to adapt themselves to the tunnel of the worm.

Prægeria remota, Southern, one of the Pisionidæ, was dredged on the west coast of Ireland (*Southern*). Southern agrees with Ehlers that *Prægeria* most nearly approaches the Aphroditidæ, resembling the Sigalionidæ "in the reduction of the head and its appendages, the forward position of the buccal segment, the shape of the compound setæ, and the presence of jaws." "I am of opinion that the elongate ventral anterior cirri of the Pisionidæ are homologous to the palps of the Sigalioninæ, that the slender dorsal and globular median cirri, together with the swollen bases which contain the prominent spines, constitute the parapodia and cirri of the buccal segment, the whole being homologous to the segment bearing tentacular cirri in *Pholoë* and the first setigerous segment in *Sthenelais*. The first setigerous segment in the Pisionidæ would then be homologous to the first setigerous segment in *Pholoë* and to the second in *Sthenelais*. In all three cases the ventral cirrus of this segment is elongate and functions as a tentacular cirrus, a remarkable resemblance, which is best explained by the theory of close relationship."

Whilst these views are full of interest, it has to be added that no known Sigalionid, or other allied form, shows anything approaching the condition in the cephalic region of *Prægeria* with its remarkable spines, though the proboscis, its circlet of papillæ, and its jaws have a near resemblance to those in the Polynoidæ and allied forms. The length of the feet and the proportionally great size of the bristles, which stretch far inward into the tissues of the body, are more in consonance with a pelagic habit than are the bristles and feet of the Sigalionidæ. Further, the bristles themselves have a closer approach to those of the Syllids than to any other group, even to the serrations on the enlarged distal region of the curved shafts. The simple condition of the dorsal bristle is akin to that observed in *Syllis spongicola* and *S. gracilis*, whilst even a more complex arrangement is seen in *Ancistrosyllis greenlandica*. On the other hand, the presence of teeth diverges from anything at present known in the Syllids—even from the condition in the parasitic *Syllis* on the eel.

Were the facial tubercle present in *P. minuta*, then the other characters of *P. tuberculata* might reasonably be construed as those of a variety of the common form, viz., the "absence of papillæ on the tentacular cirri" (since some occur at their base), the more numerous papillæ on the feet and the ventral surface, and the shorter papillæ on the scales. The occurrence of white pigments in the palps and scales is a feature of the variety. No facial tubercle has been made out in the common form, therefore Southern's species stands.

The post-larval examples of *Pelagobia longicirrata*, Greef, procured in the Irish Sea *, present two stages—different from those figured by Reibisch, but agreeing in general structure. The younger has three bristled segments, the large head (for at its posterior border it is equal to the diameter of the body) is broadly shield-shaped, the narrower border being anterior. Two eyes—antero-posteriorly elongated—occur toward the posterior border and are widely separated. A tentacle projects on each side of the anterior margin. The second pair arise behind each eye, are subulate in shape, and slant forward. A pale area in the centre of the snout indicates the mouth, which is at the anterior extremity, and a small ovoid area occurs in the lateral region and probably indicates the nuchal organ, which is conspicuous in Greef's form. The head thus differs from Greef's in the antero-posteriorly elongated eyes and in the brevity of the tentacles, but it has to be remembered that his form is much more advanced.

The *body* is nearly cylindrical, though the two terminal segments are considerably narrower, and has three bristled segments, the first feet being the shortest, a brief interval separating them from the head. Each forms a simple blunt cone standing at right angles to the body and furnished with a series of delicate translucent bristles with articulated terminal pieces like those of Phyllodocids. The second feet are considerably larger, also stand nearly at right angles to the body, and their bristles are longer and stronger. The third pair slope distinctly backward. Each foot except the last has a small subulate dorsal cirrus, which projects only a little beyond the tip of the setigerous lobe, and is in contrast with the two long cirri of Greef's type.

Behind the third foot is a narrow segment with a slight

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* For these examples I am indebted to Mr. Chadwick of the Port Erin Marine Laboratory.

lateral projection, from which a single bristle projects. Then follows the still narrower anal segment, which has two subulate anal cirri. If Reibisch's figures are to be trusted this species would appear to differ, since he shows only two conical processes terminating the body, but perhaps the cirri had been lost. In the original description of Greef the anal cirri are almost bulbous at the base with a terminal, slender, subulate process.

The proboscis occupies the first bristled segment, is nearly circular in outline, with a median fissure from which transverse striæ pass. A narrow process of the gut joins this to an enlargement between the second and third feet, after which the intestine diminishes to the terminal vent.

The second example has advanced a little, since the fourth foot now projects with its tuft of bristles, the anal segment remaining as before. The anal cirri spring close together on the ventral surface, and extend backward as short subulate processes, their total length being about the transverse diameter of the anal segment. They present no bulbous base as in Greef's species, and differ from the stumpy conical condition shown throughout all the stages of Reibisch's examples.

Greef's [*] specimens were procured in the Bay of Arrecife, Canary Islands, from January to May. The body had fifteen segments and was 3 mm. in length. The head and first segment had a reddish tint, the rounded reddish-brown eyes, situated a little behind the bases of the dorsal tentacles, had lenses, whilst the mouth opened at the tip of the snout. On each side of the posterior part of the head is a ciliated, lobate, nuchal organ. The first segment bears a pair of rather long cirri and a setigerous process; the second has shorter cirri, but the third, again, has somewhat longer cirri, and they get broader posteriorly. The bristles borne by the setigerous process have straight shafts, a bifid spur with a longer and a shorter sharp process, and a serrated terminal process with the spikes directed distally. He describes a dorsal vessel, as in *Pontodora*, in ripe examples, which has either ova or sperms. The alimentary canal has a muscular pharynx with a glandular (?) central region. He was uncertain as to the position of the species, but thought it might be near the Syllids.

Vignier † (1886) found the same form in the Bay of Algiers from December onward throughout the year. He points out that the mouth is not terminal, but on the inferior surface of the head, behind the ventral pair of tentacles, a ciliated furrow passing in front of the inferior tentacles and terminating superiorly in front of the dorsal tentacles. The groove separating the prostomium is al o ciliated. He shows that the antero-posteriorly elongated eyes rest on the cephalic ganglia, which are bar-like from transverse extension. The nuchal organs form two lateral ciliated processes on each side between the first foot and a point opposite the eye. The proboscis has a series of parallel longitudinal glands with enlarged or bulbous ends posteriorly in the centre of the organ, and when the latter is extruded these bulbous ends are distal, the tip of the organ having a smooth border. He describes and figures the pygidium as a short cone with a minute process in the centre and a circle of cilia a little in front. The foot has a spine and a group of bristles, the tips of the shafts being bevelled, and a serrated terminal blade articulated with it. The generative elements fill the cœlom, and even pass forward into the sides of the proboscis in extrusion. He considers that the form belongs to the Phyllodocidæ. The figures of this author are excellent, and in contrast with those of Reibisch, who, however, had only preserved materials.

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[*] Zeitsch. f. w. Zool. Bd. xxxii. p. 247, Taf. xiv. figs. 23, 24, & 25.

† Archiv Zool. Expér. 2 sér. t. iv. p. 377, pl. xxi. figs. 1-13.

In general outline *Pelagobia* resembles the larval stages of *Sphærodorum*, but differs in certain details, such as the median cephalic and caudal processes and the papillæ on the body, whilst the bristles seem to be proportionally longer.

Reibisch (1895) gave an account of the development of what he considered to be the same species (*P. longicirrata*) as Greef's, though slight differences are apparent. He figures the eggs and the young without tentacles, but with two eyes, two feet, and two anal cirri, and various stages up to the longest with twenty-four segments, and considers that it approaches the young of *Etone*. Its distribution is almost cosmopolitan.

Pelagobia is extensively distributed abroad, chiefly in the warmer seas of both hemispheres, yet it occurs in the waters of Greenland and ranges through the intermediate area to the South Pacific, and appears at various seasons.

Eulalia pusilla, Œrsted, a minute species, has probably been overlooked in the collections of British observers until Southern's careful investigations showed that it is not uncommon on the west coast of Ireland, whilst De St. Joseph dredged it frequently at Dinard. The dorsal cirrus is elongate-ovoid, and the two anal cirri are similar. The setigerous process bears a fascicle of slightly curved, short bristles with enlarged ends of the shafts and tapered terminal pieces with serrations. A female bore ova of considerable size in July.

Mystides limbata, De St. Joseph, was obtained by Southern off the west coast of Ireland and at Plymouth by Allen. It is a small form, the head bearing four minute tentacles in front and two large reddish eyes posteriorly. The buccal segment has two slender tentacular cirri, and the following segment has another pair, the ventral presenting a slight enlargement. The proboscis has a ring of about ten papillæ, and its inner surface is coated with large conical papillæ. The anal segment has a pair of fusiform cirri. The foot has oval dorsal and ventral cirri and a bifid setigerous lobe. The short stout bristles are curved, and the distal end of the shaft has a strong tooth and a series of spines on each side. The terminal blade is coarsely serrated and obliquely striated. Mature specimens have swimming-bristles.

Southern distinguishes it by the fan-shaped array of spines at the end of the shaft of the bristles (a feature, however, found in other forms), and by the winged expansion of the ventral tentacular cirrus on the second segment. Allen observes that a female with dark green eggs occurred in May, and that a small median tentacle exists as in *Eulalia*, "but in the majority of specimens it is difficult if not impossible to make it out."

De St. Joseph points out that certain Phyllodocids, such as *Eulalia problema*, Mgrn., have capillary bristles as in Syllids, and that *Eulalia gracilis*, Verrill, showed signs of scissiparous development. The presence of large eyes and capillary bristles in *M. limbata* is another example, and he thinks it probable that at maturity these will be fully developed as swimming-bristles. Gravier, however, found females with much-developed eggs in which these bristles were disappearing.

Mystides bidentata, Langerhans, also occurred on the west coast of Ireland (*Southern*). The head is elongate, and the tentacular cirri long. The body has about 190 segments, and measures from 5–25 mm., the colour being greenish yellow, and a dark brown spot exists at the base of each foot ventrally. The anal segment has two slender cirri enlarged at the base, and a long papilla between them. The feet have ovate cirri, and the setigerous lobe is bifid. The ventral bristles are thicker than the median, and the terminal pieces shorter; dorsal bristles intermediate. The dilated and bevelled tip of the shaft bears two unequal claws, and is spinous. The bristles are longer and more slender than in *M. limbata*, and the ventral cirri of the second segment are large. Mature forms have swimming-bristles. In contrast with *M. limbata* the coloration of this species differs, and the dorsal and ventral cirri appear to be proportionally larger.

Mystides borealis, Théel, from the west coast of Ireland (*Southern*), is another of the minute examples (5½ mm. long) of the genus, which can best be studied in the living condition, and it is possible that revision may alter certain of the views at present held. Southern's careful descriptions, however, will aid materially in their elucidation. The broadly oval cirri of this form are conspicuous. The bristles are slender and of moderate length (*Southern*).

Mystides elongata, Southern, is a remarkably elongate Irish form, with long setigerous processes, long segments, and peculiar bristles. The head is twice as long as broad, and has two eyes devoid of lenses in the postero-lateral angles. The body is minute (6 mm.) and has 80 segments. The colour is yellowish or dark green. The first segment has a single pair of long tapering cirri, the second has two pairs, but there are no traces of spines or bristles. The third segment has a setigerous lobe and a ventral cirrus. The setigerous lobe generally is bluntly pointed, and has a spine and four bristles, whilst the dorsal cirri are small and fusiform; ventral cirri longer. Three of the bristles in each foot are compressed, the shaft being thick, curved, bevelled (but not swollen at the tip), and bifid. Mature females have bluish-green eggs (*Southern*).

In *Oxydromus propinquus*, Marion and Bobretzky, from the west coast of Ireland (*Southern*), one of the Hesionidæ, the *head* is somewhat cordate in outline, broad posteriorly where the dimple is, nearly straight at the narrower anterior end, and having four eyes in a trapezoid about the middle, the anterior pair being bean-shaped, larger, wider apart, and furnished with lenses. The median tentacle is short and slightly fusiform, the lateral more than twice as long, a little tapered toward the tip, and separated from the rest of the head by a ciliated depression. The palpi have two articulations, a basal and a longer distal. Four tentacular cirri occur on each side, the largest and longest being the posterior dorsal, and in each a nerve is distinct. The proboscis, which has a minutely papillose surface, is of a bright orange hue, and extends to the fifth setigerous segment. Anteriorly it has a series of serrated papillæ. It is followed by the intestine, which is constricted at each dissepiment. The *body* varies in length from 6–10 mm., is typical in outline, and terminates posteriorly in two long articulated anal cirri and a median process. The general aspect is pale, with symmetrical brownish bars and two median touches in each segment. De St. Joseph describes the proboscis as unarmed, and furnished with numerous papillæ at the tip. The feet are well developed and, at the reproductive season, the ova pass into them. Dorsally is the long articulated cirrus, and ventrally the shorter ventral cirrus. At the base of the former is the dorsal setigerous process bearing a series of long simple bristles, slightly curved, with a serrated (spinous) edge, the process being further stiffened by two spines, one of which, curved in the young form, projects amongst the bristles. The ventral series has articulated terminal pieces, more or less bifid, and longer or shorter according to position, the longer dorsal and the shorter ventral. The foregoing description is chiefly that of Marion and Bobretzky. Southern states that it swims gracefully through the water, stops, and even swims backward when its progress is arrested.

Castalia fusca, Johnston.—Two varieties of this species were found by Southern on the west coast of Ireland. The first was dredged in Clew Bay in 24 fathoms, on a bottom of sand and shells, and differed from the ordinary form in having red eyes, the absence of spines on the terminal portions of the bristles which are shorter and thicker, the terminal pieces tend to be bifid at the tip, and the bevelled end of the shaft is bifid. In the second variety from Ballynakill Harbour, the bristles are similar, but longer, the tips of the shafts pointed, not bifid, the terminal pieces are longer, with fine spikes, and the bifid nature of the tip is more distinct, the coarse spikes on the terminal pieces being absent. Further, in a number of segments in the middle of the body the dorsal division has a large curved spine (*Southern*).

In *Microphthalmus sczelkowii*, Mecznikow, the head is rounded in front, indented posteriorly, with a single pair of black kidney-shaped eyes posteriorly and four slender tapering tentacles anteriorly. A median tentacle occurs at the posterior indentation. The three pairs of tentacular cirri are somewhat enlarged at the base. The body-segments are about forty, and the length 6 mm. The dorsum has ill-defined bands of brown pigment. The dorsal cirrus of the third segment is the longest, and all are about twice as long as the ventral. The dorsal division of the foot carries a single slender spine and a single small bristle with a lyrate tip; ventral division with a single large spine and a group of Hesionid bristles.

This is one of the interesting additions made by Southern on the south-western shores of Ireland. The structure generally is that of a Hesionid, but its special features consist in the peculiar lyre-shaped dorsal bristle and the hood-like extension of the pygidium. Mecznikow's original description is diagnostic, and he mentions that he found a female with eggs in segments 13 to 24.

In the family of the SYLLIDÆ, Caullery and Mesnil * propose to institute a new genus, viz., *Parexogone*, for the *Pædophylax hebes* of Webster and Benedict, which Southern has procured on the west coast of Ireland, the head being formed into a sort of cone with fused palps. The anterior region of the alimentary canal is muscular, with proboscis, crop, and gizzard. The cuticle is thick. The animals frequent compact sand, and the habit for Syllids is thus peculiar. Moreover, an important paper on the group, with excellent illustrations, has recently been published by Prof. Haswell †, in which both systematic and structural features, as well as developmental investigations, are detailed. Amongst other interesting structural points he found that in some the nephridia of each pair unite completely at sexual maturity. In *Exogone fustifera* the extruded egg becomes attached by one end to the area on which the ducts of the pedal gland open—internal to the ventral cirrus. He points out that in *Exogone fustifera* the formation of the cœlom differs from that of the Polychæta generally, since the stomodæum ends behind a mass of tissue (syncytium) in which the large yolk-granules are embedded. The changes in this take place before the young annelids become free.

In *Parexogone hebes*, var. *hibernica*, Southern, the head is separated from the palpi and buccal segment by faint grooves, and the length exceeds the width. Three tentacles—a long subulate median and two small laterals, which are about one-fifth as long as the median. Three pairs of eyes outside the lateral tentacles, and they vary in size ; exterior to them are conspicuous, ciliated, nuchal organs. Palpi large and fused dorsally, a shallow groove between them ventrally. Brain elongated and bilobed. Buccal segment as large as the head, bearing a pair of small bulbous tentacles with stiff cilia at the tip. The body is about 7 mm. long, with thirty-one bristled segments, somewhat fusiform, creamy white in colour, without other pigment. The proboscis extends from the second to the fifth bristled segment,

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* Bull. Soc. Zool. France, xlii. p. 127, 5 figs. (1918).

† Journ. Linn. Soc. vol. xxxiv. p. 217, pls. xvii., xviii.

is covered with dark pigment except a narrow strip in the fourth segment. Anterior part of proventriculus long and narrow, with twenty rows of glands, the succeeding portion being muscular and non-glandular, with two small ciliated sacs. The proboscis has ten soft papillæ anteriorly and a conical tooth. Colour grey or flesh-colour, eyes dark red or black. The foot has an unequally bilobed setigerous process, the dorsal portions with the spine being the smaller and having a rounded papilla near the tip. Dorsal cirrus small and bulbous with stiff cilia distally. Bristles in a fan-shaped series: shafts curved, swollen and bevelled at the tip; terminal pieces coarsely spinous proximally, and some distance below the tip is a broad tooth. A single spine is present, its tip being enlarged and smooth. A simple dorsal bristle appears in the seventh foot, and is joined in the posterior seven segments by a similar ventral bristle, this type being curved and pointed with a spur at the base, as in various Syllids. A female in May had two ova in each segment from the tenth to the twenty-second (*Southern*).

Grubea limbata, Claparède, comes from low water and the laminarian region at Plymouth (*Allen*). The *head* has a similar arrangement of the tentacles to that in *G. clavata*, the two lateral being anterior, the median posterior, and they are somewhat fusiform, the base being enlarged, whilst the distal region is tapered. Four large brownish eyes occur posteriorly, the anterior being wider apart, and all have lenses. The proboscis occupies segments 2–5, and has no denticulations on the anterior rim, but the lateral walls are crenulate. The pigmented layer is marked by a pale ring as in *G. tenuicirrata*, and the organ presents a glandular appearance. The proventriculus is in segments 6–8, and has twenty rows of glands; its anterior part seems as if clothed with a horny coat, which may be a continuation of the proboscidian tissue. The stomach is in segment 9 and has a pair of glandular pouches. The chloragogenous intestine follows.

The head of *Grubea pusilla*, Dujardin, from the west coast of Ireland and Plymouth, has long soldered palps; four lateral tentacles towards the anterior part of the head, the longer median in front of the posterior border, all having the fusiform enlargement at the base, whilst they are tapered distally. The four eyes are furnished with lenses, and the anterior are wider apart. There are four tentacular cirri. The proboscis is smooth with tooth near anterior end. The body is about 2–5 mm. in length, and has from twenty-eight to thirty-four segments. Posteriorly

Langerhans describes an unpaired median appendix between the anal cirri. Feet with the fusiform dorsal cirri truncated, with bacilli in the interior. Ventral cirri filiform, short, the ventral bristle is bidentate, and with spines along its margin distally.

Reproduction.—Ripe females were found by Dujardin, Marenzeller, and Langerhans, the latter stating that in one with thirty segments two eggs occurred in each segment from the eleventh to the twenty-second. De St. Joseph (1886) mentions that the males have swimming-bristles and sperms; whereas the females are devoid of swimming-bristles, and carry two eggs ventrally on segments 10–26. But he has also met with one devoid of swimming-bristles carrying embryos on the dorsum from the tenth to the fifteenth segment (six segments). Usually they are fixed by their anal segment to the ventral surface of the parent, near the ventral cirrus, and so placed that their dorsal surfaces are in keeping with that of the mother. They have four eyes in a line, three tentacles, four tentacular cirri on the buccal segment, rudiments of proboscis and proventriculus, whilst a mass of orange yolk occupies the position of the intestine. There are four setigerous segments and the anal has two small cirri. The dorsal cirri have the truncated form of the adult, but contain no bacillary bodies; and they are absent from the second setigerous segment, thus differing from the adult. The minute ventral cirri are present on four segments. The palpi, longer than the head, are less attenuate in front than in the adult. He further notes, as a distinction between this species and *G. clavata*, that the embryos are developed in eggs on the dorsum of the parent, whence they escape when sufficiently advanced; whereas in *G. pusilla* they are developed on the ventral surface of the mother, to which they remain adherent after leaving the egg. He adds a caution, however, that possibly variations occur in both.

Prof. Haswell has found a hermaphrodite condition of the species in Australia (Port Jackson), for one or two male segments are followed by a number of female ones, thus resembling such Serpulids as *Filograna*. In *G. quadrioculata* he found the ova attached dorsally between the cirrus and the foot. Mr. Southern met with a mature male in March, whilst specimens with embryos attached occurred in May.

Sphærosyllis erinaceus, Claparède, comes also from the west coast of Ireland. It was introduced by Claparède (from Normandy) as having a body about 2 mm. long. Palpi broad, almst club-shaped when viewed from the dorsum; six eyes—four median forming a square and the other two external. Anal cirri slender. There are twelve segments. The body is from 1·40 to 2 mm. in length, and has about twenty-two bristled segments.

De St. Joseph found a single ripe female, 1·40 mm. long, at Dinard at the depth of 26 mètres. There were twenty-two setigerous segments. The median tentacle arises in a line with the posterior eyes—a single pair of tentacles occur on the achetous segment fused with the head. The eyes agreed with the type, and so with the dorsal and anal cirri. No dorsal cirri on the setigerous segments. The ventral bristles have long tips with a simple extremity—long and pectinate. At the seventh segment is a simple dorsal bristle. Seventeen rows of glands (*points gris*) occur on the proventiculus; stomach with lateral pouches. From the ninth to the eighteenth segment four eggs in each, but no swimming-bristles. He doubts if the form of Langerhans is the same, since it differs in the palps which are higher, and in the position of the tooth in the pharynx which is in the middle. Moreover, the bristles differ in structure, though it must be said that neither is drawn with sufficient detail. The number of eggs in each segment also differs. There is perhaps room for doubt as to the separation of some of these minute forms, even though they are apparently mature.

Mr. Southern found another species, viz., *Sphærosyllis bulbosa,* on the rich western coast of Ireland. . In this the head is oblong, with rounded corners, and bearing four large eyes with lenses. The fused palpi are long and broad with a faint dorsal furrow, but a conspicuous ventral groove. Between the head and peristomium are the nuchal organs. The proboscis has a bluntly rounded tooth in front and a series of soft papillæ. There are fourteen rows of glands in the proventriculus. The body is 5–6 mm. long, and has forty-eight setigerous segments, widest in the anterior third and tapering toward each end. No papillæ occur on the body, only on the feet and anal segment, which has two cylindrical papillæ with slightly enlarged bases. The spines are stout with a bulbous tip, and the compound bristles are few and have short terminal pieces.

Sphærosyllis ovigera, Langerhans, is another minute form from the west coast of Ireland (*Southern*) and from Plymouth (*Allen*). In this form the *head* has four large eyes, the posterior pair nearer each other, the anterior a little in front. The three tentacles are in a transverse line, the median often in front of the anterior eyes. The palpi are broad and flattened. The *body* is about 1·5 mm. in length, and the mature form has from twenty-four to twenty-eight segments, the surface being beset with papillæ and encrusted with sand and mud, a feature which enabled Dr. Allen to separate it from *S. hystrix* found along with it. The dorsal cirri are short, with enlarged bases, so as almost to be pear-shaped, and there are two thick anal cirri. The pharynx has a tooth anteriorly and the proventriculus has ten rows of glands. The dorsal bristles are simple, slightly curved at the tip. The terminal process of the ventral bristles is somewhat long with a curved end and spikes; moreover, the end of the shaft is dilated, with a process in front.

Langerhans found two males with swimming-bristles and sperms. A female carried eggs on segments 12–15, whilst another had on its ventral cirri either ova or embryos. The female had no swimming-bristles. He thought that it approached *S. pirifera* and *S. hystrix*, but the great size of the palpi and the shape of the median tentacle are characteristic.

This species is entered in the list from Plymouth, but some uncertainty exists, though it may yet be found on the southern coasts. As mentioned on page 159 of vol. ii. Part I. of the Monograph, Dr. Allen's preparation showed that the structure of the foot, the presence of a single slightly curved and pointed bristle, and the structure of the compound bristles all agree with *S. hystrix*. The example from Plymouth did not show the spine on the enlarged terminal region of the shaft as figured by Langerhans.

In connection with the Syllids the recent interesting remarks of MM. Caullery and Mesnil[*] on viviparity and parthenogenesis may be mentioned. They found a form, *Ehlersia nepiotoca*[†], sp. n., amongst *Lithothamnion* at La Hague, with young at different stages of development and to the number of a dozen in the cœlom—and without traces of any male or of hermaphroditism. They are inclined to suppose that in certain forms of these and other Syllids a life-cycle occurs, in which, after normal reproduction, parthenogenesis takes place, as in Aphides and *Cecidomya* in some generations. A considerable number (over a dozen) have been added to the British Fauna lately, and more will probably yet be found by a further minute search of shore and sea.

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[*] Compt. Rend. t. 163, p. 750 (1916).

[†] *νηπιος*, young, and *τόχος*, viviparous.

Pierantoni* has also extended the list of species of *Pionosyllis* bearing ova or larvæ. His *P. gestans* has a series of fourteen or fifteen well-developed larvæ along the ventral surface; *P. elegans* bears eleven or twelve laterally; *P. papillosa* carries a large ovum on each side for twenty-one segments; whilst *P. minuta* has fewer ovigerous segments. The dull purplish ova of *Sphærosyllis hystrix* again are borne below the dorsal cirri.

In the genus *Pionosyllis* is *P. serrata*, which Southern procured on the west coast of Ireland. It has six eyes, the anterior mere specks at the bases of the lateral tentacles, the middle large, with the lenses directed forward, the posterior nearer each other and the lenses directed backward. The body is minute, 2·5 to 3 mm. long with twenty-seven setigerous segments. The anal segment has two slender subulate cirri. The dorsal cirri of the first setigerous segment are the longest of all the appendages. Foot with a bluntly pointed setigerous lobe bearing a small dorsal papilla at the tip. The bristles have the ends of the shafts enlarged and bevelled, with conspicuous spines, lower bristles simply hooked. Of the sixteen bristles in each foot, five to seven are bifid.

In *Syllis* (*Typosyllis*) *variegata*, Grube, which Southern distinguishes from *P. prolifera* by its colour-pattern, the tips of bristles are less boldly bifid and the edge more serrate; whilst the spines in the posterior feet are very thick and bluntly pointed, especially in young specimens.

Streptosyllis websteri, Southern, from the same region, has the feet prominent, five characterising the anterior region, the spine in the first segment being thin as in the posterior segments. In segments 2–5 the spines are large and thick. A single simple bristle is present in the dorsal region throughout. At the sixteenth foot the setigerous lobe is smaller, but the ventral cirrus is longer than in the anterior region. Bristles in segments 1–5 shorter and thicker than in the others. Behind these the bristles are thinner, have serrate terminal pieces, and the end of the shaft is serrated on one edge and has four sharp processes, whilst the spine is slender with a bulbous tip, Capillary bristles begin at the 11th segment and extend almost to the tip of the tail in the mature males (the only forms found).

Southern states that this species is most closely allied to *S. varians*, De St. Joseph. It resembles it in having five

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* Arch. Zool. Napoli, vol. i. pp. 231–252, taf. 10 & 11 (1911).

setigerous segments in the anterior region and in having simple tips to the compound bristles. It differs in the presence of a slender spine in the first setigerous segment, in the shape of the terminal pieces of the anterior bristles, in the occurrence of simple dorsal bristles in all the segments, in having three anal cirri, and in other details. These differences, however, require further investigation.

Streptosyllis bidentata, Southern, is characterised by the broad head, four large eyes with lenses, the median tentacle arising between the anterior pair, the palps fused at the base, invisible from above, and with slender papillæ on their tips. The body is minute—about 2·5 mm. Proboscis short and broad, proventriculus with forty-five rows of glands. The feet of the six anterior segments differ from those behind. The foot has dorsally a simple bristle, winged and curved distally. The compound bristles are short, thick, and the ends of the shafts have three or four blunt teeth, whilst the terminal pieces are bifid and coarsely serrated. The structure of the simple, serrated, winged bristle recalls that of *Staurocephalus*. It differs from *S. varians* in the length of the proboscis and proventriculus, in the moniliform condition of some of the dorsal cirri, in the larger palps, in the minute structure of the bristles, and in the greater number of the anterior segments with thick spines. It differs from *S. websteri* in having six segments in the anterior region and in the structure of the bristles (*Southern*).

In *Opisthodonta pterochæta*, Southern, the palps are free distally, but united at the base. The buccal segment has two pairs of tentacular cirri, all cylindrical and smooth. The body is more than 6 mm. long and has forty-nine segments, the pharynx stretches through sixteen segments and has a sharp lateral tooth about its middle, the proventriculus has forty-five rows of glands. The bristles have enlarged spinous ends to the shafts and simple curved tips. Swimming-bristles occur on the 31st foot. In the middle region the foot is biramous, dorsally having capillary bristles, ventrally a single upper winged bristle, four or five compound, and a single bristle without wings below.

Southern found, on the west coast of Ireland, a mature female of *Ehlersia ferruginea*, Langerhans, in March, with a long tuft of swimming-bristles on the twenty-eighth segment and no sign of a bud, so that it is probable it reproduces directly and may pertain to *Pionosyllis lamelligera*, De St. Joseph. It differs from *Syllis cornuta*, Rathke, in having smooth dorsal cirri and in the structure of the bristles, which, however, diverge very little from those of *E. cornuta*, Rathke. The figures of Langerhans, representing the bristles of the second and twenty-third segments, are the only ones available.

Of *Eusyllis lamelligera*, Marion and Bobretzky, Allen observes that it is a well-defined species, distinguished by the enlarged and leaf-like shape of the first ventral cirri. He dredged a female with nearly ripe eggs in July on Mewstone Ledge, Plymouth. Marion and Bobretzky procured a ripe male in January without swimming-bristles. They consider that, though it approaches *E. blomstrandi* in the non-moniliform dorsal cirri, in the fusion of the palpi at the base, and in the presence of six distinct eyes on the head, it is different. The first dorsal cirrus is long and the first ventral cirrus is foliaceous. The bristles, moreover, differ. No example has been seen by the writer, but Dr. Allen intends to publish an account of this and other forms he has recently procured.

Eusyllis monilicornis, Malmgren, was dredged by Allen at Plymouth, and it is apparently more common in the south on both sides of the channel. It has six eyes, two being small, and the palps are long, but fused at the base. There are from fifty-two to sixty-seven segments of the body, which is from 10 to 15 mm. long. The dorsal cirri of the second and fifth segments are longer than the following, which are unequal amongst themselves. The feet have two kinds of bristles, viz., those with long and those with short tips. The colour is pale orange with a patch of dark brown or black on the hind part of the head.

Autolytus macrophthalmus, Marenzeller, occurs both at Plymouth and on the west coast of Ireland. The head is distinguished by the large size of the eyes which cover a considerable portion of the surface, and there are occasionally a few additional specks. The length of the body varies from 8–20 mm. The violet or reddish proboscis is barrel-shaped and has forty-four rows of violet points. The colour is light orange and the tips of the tentacles are orange.

De St. Joseph met with an example of 20 mm. in length in which the sexual elements covered the dorsal vessel and fell into the cœlom; and another of seventy-two segments in which the head of a female bud with four eyes appeared at the fourteenth segment, yet it had no ova, no swimming-bristles, and no modification of the intestine. A third example, a nurse-stock of thirteen segments, had a female stolon of fifty-eight segments with the head well developed, the body filled with eggs from the third segment to within twenty of the tail. Its swimming-bristles were developing. From the fourteenth segment of other examples a male bud depended, with or without natatory bristles and altered or unaltered intestine, according to the development of the spermatozoa. In the sexual buds there were many red points on the ventral surface, and the segmental organs were developing. The French author is inclined to think with Langerhans that the *A. macrophthalma* and *A. luxurians* of Marenzeller refer to the same form.

Southern also considers *A. luxurians*, Marenzeller, synonymous with this species, the only difference being that *A. luxurians* has small reddish-brown eyes, whereas in this the eyes are large and red.

Autolytus brachycephala, Marenzeller, is another species from the west coast of Ireland (*Southern*). The head has four large eyes, occasionally with additional specks. The tentacular cirri and cirri of the second segment are longer than the following. The reddish-violet pharynx has thirty marginal papillæ. Each segment has a double row of pigment-grains. The dorsal cirri are alternately long and short.

Autolytus punctatus, De St. Joseph, comes both from Plymouth and the west coast of Ireland. The head is of moderate size, the anterior eyes large, the lenses projecting in front, the smaller posterior pair having the lenses directed posteriorly. The body is colourless, except for a faint tinge of orange. Each segment, except the buccal, bears a double transverse row of small greyish glands. The proboscis has twelve obtuse denticulations anteriorly, alternating with another twelve pointed processes. The feet are typical.

Autolytus edwardsi, De St. Joseph, likewise was procured both at Plymouth and the west coast of Ireland. Four eyes occur behind the slender tentacles. The length of the bud is about 14 mm., and it has a longitudinal streak of orange on each side of the dorsum in the nurse-stock; the appendages of the head and the first three segments have orange tips. The dorsal cirrus of the second segment is long, that of the third much shorter, whilst the following are nearly equal. The proboscis has twenty-four small denticulations and the reddish proventriculus is elongate, occupying segments 7–9.

De St. Joseph observes that he occasionally met with an *Autolytus* which he could not distinguish from this species except by the absence of the two reddish-orange bands on the anterior segments. It also bore stolons, and he considered it a variety of this species.

Allen found the breeding-season from March to June at Plymouth.

Autolytus lugens, De St. Joseph, from Plymouth (*Allen*), has a comparatively small head, surmounted by a massive median tentacle, the lateral tentacles being much smaller. Four eyes. The body is small, but typical; the proboscis has only six denticulations. The proventriculus has twenty-six to thirty rows of grey points and occupies segments 8-11.

This is one of several of the Syllids which requires re-investigation, since it may be connected with other known forms. De St. Joseph met with specimens having male buds. Allen observed early stolons in January and February at Plymouth, and a well-developed one in July.

Six specimens of *Procerastea halleziana*, Malaquin, were procured amidst Ascidians from a raft moored in Cawsand Bay, Plymouth, in September (*Allen*). A brief, but excellent, summary of the stolonisation of this form is given by Mr. F. Potts* along with other types of reproduction in the Syllids. In *Procerastea halleziana*, as shown by Malaquin, the twelve to fifteen new segments are intercalated in the middle of the stock, and not at the posterior end as usual in the Syllids. Thus there may be in front twenty to twenty-two original segments, fourteen to sixteen of recent formation, and then eighteen to twenty more of the original stock, the middle showing the more advanced development of the foot. The head of the stolon is formed on the fourteenth segment. The parts soon assume the condition of the adult. Dr. Allen has a further communication on this subject lately, an abstract of which appeared in the notice slip of the Royal Society (1921).

XXVIII.—*New or little-known* Tipulidæ (*Diptera*).—VI. *Ethiopian Species*. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Urbana, Illinois, U.S.A.

THE material considered in the present instalment was received for study from the Carnegie Museum in Pittsburg, through the kindness of the Director, Dr. W. J. Holland, and the Curator, Mr. Hugo Kahl, and from the Staatsmuseum in Vienna, through the kindness of the Custodian of the Diptera, Dr. Hans Zerny. The latter collection was one of the very greatest importance. The location of the types of the new species described herein is designated after each description.

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* Spengel's 'Ergebnisse und Fortschritte Zoologie,' Bd. iii. p. 30.

Dicranomyia mascarensis, sp. n.

General coloration brown; wings greyish hyaline, stigma oval, pale brown; pale brown seams at origin of *Rs* and along the cord; Sc_1 ending immediately before the origin of *Rs*; cell *1st* M_2 closed; basal deflection of Cu_1 immediately before the fork of *M*.

Male.—Length about 1·2 mm.; wing 5·2 mm.

Rostrum and palpi dark brown. Antennæ dark brown. Head dark brown, discoloured in the type.

Mesonotum dark brown, any possible pruinosity discoloured in the type. Pleura and sternum dark brown. Halteres rather elongate, brown, the basal portion of the stem obscure yellow, the apices of the knobs a little paler. Legs with the coxæ dark; trochanters obscure yellow; remainder of legs testaceous-brown. Wings greyish subhyaline; stigma oval, pale brown; a brown cloud at the origin of *Rs*; very indistinct brown seams along the cord and outer end of cell *1st* M_2; veins dark brown. Venation: Sc_1 ending immediately before the origin of *Rs*, Sc_2 apparently close to the tip of Sc_1; *Rs* gently arcuated; *r* faint, at the tip of R_1; inner end of cell R_3 far proximad of cell R_5; cell *1st* M_2 closed, about as long as vein M_{1+2} beyond it; basal deflection of Cu_1 a short distance before the fork of *M*.

Abdomen dark brown, the basal sternites paler. Male hypopygium with the pleurites very short and stout, the proximal face near the apex with three cylindrical fleshy lobes that are tipped with long bristles, one of these lobes slender, arcuate, the others shorter and stouter; proximal side of pleurite extended caudad into a fleshy arm that is setigerous on proximal face. Ventral pleural appendage much larger than pleurite, pale, subcircular in outline, the proximal margin extending proximad into a fleshy lobe with two spines on the caudal margin near mid-length of the lobe. Dorsal hook conspicuous, almost straight, the distal third gently curved, the tip suddenly narrowed to an acute point.

Hab. Mascarene Islands.
Holotype, ♂, Reunion (*Sikora*).
Type in the collection of the Vienna Museum.

Gonomyia (*Leiponeura*) *mascarena*, sp. n.

General coloration brown, the pleura plumbeous, striped longitudinally with pale yellow; posterior femora yellow with two brown subterminal rings; wings clouded with pale brown and whitish subhyaline; small brown spots and seams along the cord; Sc_1 ending opposite the origin of *Rs*; cell 1*st* M_2 closed; abdomen dark brown, the caudal margin of the segments conspicuously white.

Female.—Length about 5 mm.; wing 4·8 mm.

Rostrum and palpi dark brown. Antennæ brown, the second scapal segment obscure yellow apically. Head pale whitish, the vertex darker medially.

Pronotum white. Mesonotal præscutum light brown with three confluent darker brown stripes; scutum brown, the proximal margin of each lobe obscure yellow; scutellum obscure yellowish, darker basally; postnotum obscure yellow, darker posteriorly. Pleura plumbeous; a conspicuous pale yellow longitudinal stripe extending from behind the fore coxæ to the base of the abdomen; dorsal-pleural membrane light brown. Halteres whitish, the knobs slightly darkened. Legs with the coxæ and trochanters yellowish; only one hind leg remains, femora obscure yellow with a broad brown subterminal ring with a narrow and less distinct brown ring before this at about three-fourths the length of the segment, the yellow ring enclosed, narrow; tibiæ and metatarsi yellow, the tips narrowly infuscated; remainder of the tarsi dark brown. Wings with a faint brownish tinge, variegated with whitish subhyaline and brown; stigma oval, grey; small brown spots beneath arculus; at tip of Sc_1 and origin of *Rs*; along cord and outer end of cell 1*st* M_2 and at tip of R_{2+3}; costal margin of wing indistinctly whitish subhyaline, this including cells *C*, *Sc*, and R_1; vague subhyaline areas at the wing-tip, in cell 1*st* M_2, and at the end of vein 1*st* *A*; veins dark brown. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 close to tip of Sc_1; *Rs* long, angulated and spurred at origin, only a little shorter than R_{2+3}; basal deflection of R_{4+5} a little longer than *r–m*; cell 1*st* M_2 closed; *m* longer than the deflection of M_3; basal deflection of Cu_1 before the fork of M a distance about equal to m.

Abdominal segments dark brown, the caudal margins conspicuously ringed with white; genital segment and ovipositor horn-coloured.

Hab. Mascarene Islands.

Holotype, ♀, Reunion (*Sikora*).

Type in the collection of the Vienna Museum.

Trentepohlia (*Mongoma*) *metatarsatra*, Alexander.

1920. *Trentepohlia metatarsatra*, Alex. Ann. & Mag. Nat. Hist. ser. 9, vol. vi. pp. 41, 42.

The unique type of *T. metatarsatra* was in poor condition when described. A male is at hand, which is here characterised as allotypic. The specimen differs from the description of the unique type in the following regards:—

Head obscure yellow, slightly greyish pruinose adjoining the inner margin of the eyes. The white tibial bases are broad and pass insensibly into the brown tibial ring. Wings with r close to the fork of R_{2+3}. Abdomen uniformly pale brownish yellow, including the hypopygium.

Male.—Length 8–8·2 mm.; wing 8·4 mm.

Allotype and two additional males from Bukoba–Usumbura, between Lakes Victoria and Tanganyika, 1910 (*Grauer*).

Allotype in the collection of the Vienna Museum.

Lecteria tanganicæ, sp. n.

General coloration reddish fulvous, the præscutal stripes inconspicuous; head bluish plumbeous; legs obscure yellow, the tips of the femora, tibiæ, and metatarsi narrowly infuscated; wings yellow, the origin of Rs, the cord, and the tip of R_2 rather narrowly seamed with brown; abdomen brownish fulvous, including the hypopygium.

Male.—Length 21–22 mm.; wing 18–19 mm.; abdomen alone 16·5–17·5 mm.

Rostrum and palpi dark brown. Antennæ with the scapal segments obscure brownish yellow; flagellum light brownish yellow. Head bluish plumbeous, paler behind.

Pronotum dark brown medially. Mesonotum deep reddish fulvous, the lateral præscutal stripes indicated, brown;

the median præscutal stripe is indicated only as a narrow line near the anterior margin of the sclerite; remainder of the mesonotum obscure fulvous, slightly pruinose, the scutal lobes darkened. Pleura brown, sparsely pruinose. Halteres light brown, the knobs dark brown. Legs with the coxæ and trochanters light brown; femora yellow, the tips abruptly and conspicuously black; tibiæ and metatarsi yellowish brown, the tips passing into dark brown; remainder of the tarsi dark brown. Wings with a strong yellowish tinge, cells *C* and *Sc* more saturated yellow; conspicuous brown clouds at the origin of *Rs*, fork of R_{2+3}; paler clouds and seams at fork of *Rs*, along the cord, and at the tip of R_2; wing-tip faintly darkened; wing-veins faintly seamed with darker; veins brown. Venation: *Rs* about one-third longer than the deflection of R_{4+5}; cell *1st* M_2 subrectangular in outline; petiole of cell M_1 about as long as the cell; Cu_2 shorter than or subequal to the deflection of Cu_1.

Abdomen brownish fulvous, including the hypopygium; sternites obscure yellow.

Hab. Ex-German East Africa.

Holotype, ♂, north-west of Lake Tanganyika, 1910 (*Grauer*).

Paratopotypes. 5 ♂ ♂.

Type in the collection of the Vienna Museum.

Lecteria vasta, sp. n.

Size very large; length of female about 40 mm.; mesonotal præscutum yellowish anteriorly, the præscutal stripes indicated behind; wings brownish yellow with conspicuous darker brown clouds and washes; fusion of M_3 and Cu_1 extensive; abdominal tergites fulvous-yellow, trilineate with brown.

Female.—Length 40 mm.; wing 28 mm.; abdomen alone 33 mm. Fore leg: femur 16 mm.; tibia 19 mm.; tarsus 15·8 mm. Hind leg: femur 20·5 mm.; tibia 20·5 mm.; tarsus 10·5 mm.

Rostrum short, dark brown. Antennæ with the basal segment dark brown, sparsely dusted with greyish-yellow pollen; basal segments of flagellum brownish, fading into yellow, the terminal segments dark brown; flagellum with conspicuous verticils. Vertex obscure brownish yellow with a conspicuous, capillary, dark brown median line, darkest on the anterior part of vertex behind the antennal bases, subtended by a pale mark adjoining the inner margin of eyes; genæ dark brown.

Pronotum prominent, brown, the scutellum sparsely pruinose. Mesonotal præscutum buffy yellow, clearer anteriorly, and here bisected by a capillary dark brown line; three brown stripes, the median one broadly divided and indicated only posteriorly, the anterior half replaced by yellow; lateral stripes broad; pseudosutural foveæ conspicuous, bicolorous; scutum brown, the centres of the lobes darker brown; an indistinct, capillary, brown median line on the scutellum and postnotum. Pleura brownish testaceous, the dorsal margin of the pleurites narrowly darkened; area surrounding base of halteres pruinose. Halteres brown, the knobs dark brown, base of the stem yellow. Legs with the coxæ and trochanters relatively small, reddish brown; femora obscure yellow, becoming clearer yellow before the conspicuous dark brown tips; tibiæ obscure yellow, the tips narrowly and indistinctly darkened; tarsi obscure yellow; legs hairy; metatarsi unarmed at base; hind tarsi short. Wings brownish yellow, the costal and subcostal cells light yellowish brown; conspicuous and extensive brown clouds and washes on the wing-disk; washes in the bases of cells *R* and *M* and on the basal half of cell R_1; large and conspicuous dark brown clouds at the origin of *Rs*, at Sc_2, and at *r*; paler but extensive clouds along the cord, at the end of vein R_2, along the longitudinal veins, and as a conspicuous blotch beyond midlength of vein 1*st A* in cell 1*st A*. Venation: Fusion of Cu_1 and M_3 extensive, longer than the outer deflection of M_3 alone. The right wing of the type has an irregular cross-nervure extending across the base of cell M_3 from vein M_3 to Cu_1.

Abdominal tergites bright fulvous-yellow, the tergites narrowly trilineate with dark brown; lateral stripes also including dorsal margins of sternites; sternites obscure yellow with an interrupted, paler brown, median stripe.

Hab. Cameroun.

Holotype, ♀, Lolodorf, February 27, 1914 (*A. I. Good*). Carnegie Museum, Accession No. 5264.

Type in the collection of the Carnegie Museum.

Lecteria vasta is the largest member of the tribe Eriopterini as yet made known. In the other species of the *africana* group in which both sexes are known (*africana*, Alexander, *atricauda*, Alexander, *pluriguttata*, Alexander) the two sexes are approximately equal in size. By analogy, the dimensions of the male of *L. vasta* should be approximately those given for the type-female.

Conosia malagasya, sp. n.

General coloration fulvous-buff, the abdomen more yellowish; wings light yellow, the longitudinal veins with series of conspicuous brownish-yellow spots; *r* and the basal deflection of Cu_1 short and straight.

Male.—Length 17 mm.; wing 13·5 mm.

Rostrum fulvous; palpi dark brown. Antennæ with the basal segment brown; second segment and the fusion-segment of the flagellum dark brown; remainder of the antennæ brownish yellow. Vertex dull grey with a capillary, dark brown, median line; genæ and occiput fulvous-buff.

General coloration of thorax fulvous-buff, the præscutal interspaces with brown setigerous punctures. Pleura brownish yellow. Halteres brownish yellow. Legs brownish yellow throughout. Wings light yellow, the costal cross-veins seamed with darker yellow; conspicuous brownish-yellow washes at the origin of *Rs*, along the cord, and vein R_2: series of brownish-yellow dots along the longitudinal veins; a brown cloud near mid-length of costa and at the tip of vein *2nd A*; veins yellow, the areas traversed by the brownish-yellow spots slightly darker. Venation: a series of cross-veins and spurs in the costal cell; Sc_2 far from the tip of Sc_1; *r* short, subtransverse; *r–m* immediately proximad of *m*: vein *2nd A* slightly angulated at tip; basal deflection of Cu_1 short and straight.

Abdomen obscure yellow.

Hab. Madagascar.

Holotype, ♂, collected by Sikora.

Type in the collection of the Vienna Museum.

Compared with the smaller *C. irrorata* (Wiedemann), the present insect is notable by its large size and yellowish coloration, especially of the wings. The spots along the longitudinal veins are relatively larger and fewer in number.

PSEUDOLIMNOPHILA, Alexander.

CALOLIMNOPHILA, subgen. nov.

Similar to *Pseudolimnophila*, Alexander, s. s., differing in the possession of a supernumerary cross-vein in cell R_2. The case is entirely analogous to the subgenus *Dicranophragma*, Osten-Sacken, in the genus *Limnophila*, Macquart.

Type of the subgenus.—*Pseudolimnophila* (*Calolimnophila*) *rex*, Alexander (Uganda).

Pseudolimnophila (*Calolimnophila*) *princeps*, sp. n.

General coloration yellowish brown; first flagellar segment pale; mesonotum with a capillary, dark brown, median line; wings brown, spotted and clouded with darker, the costal margin alternately yellow and brown; abdominal sternites bicolorous.

Male.—Length about 9 mm.; wing 10·5 mm.

Rostrum and palpi brown. Antennæ with the first segment pale, sparsely silvery-pruinose; second segment brown; first flagellar segment conspicuously light yellow; remaining flagellar segments dark brown with a conspicuous white pubescence. Head brown with a greyish-yellow pollen; vertex very strongly narrowed behind.

Pronotum brownish yellow, dark brown medially. Mesonotal præscutum yellowish brown with a capillary brown median line; lateral margins of præscutum broadly paler brown, enclosing a circular yellow spot immediately behind the pseudosutural foveæ; extreme anterior margin of præscutum narrowly darkened; scutum light yellowish brown, the median area and each lobe indistinctly lined with brown; a brownish-black spot on the lateral margin of the præscutum above the wing-root; scutellum and postnotum light yellowish brown with an indistinct brown median line. Pleura yellowish testaceous, the dorsal pleurites largely suffused with brown. Halteres short, dark brown, the base of the stem paler. Legs with the coxæ pale, testaceous, the extreme bases darkened; remainder of legs pale brownish yellow. Wings with a strong brownish tinge, spotted and clouded with still darker brown, these areas distributed as follows: At origin of *Rs*, tip of *Sc*, above the fork of R_{2+3}, tip of R_1, at the supernumerary cross-vein in cell R_2, tip of R_2, along the cord and outer end of cell *1st* M_2; more diffuse clouds at ends of the longitudinal veins; a series of about five small spots behind vein *Cu*; the anterior region of the wing in the radial cells is variegated with yellow, these spots lying between the brown spots, the most conspicuous beyond Sc_1 and R_1; veins dark brown. Venation: A supernumerary cross-vein in cell R_2 at about two-thirds the length of vein R_2; petiole of cell M_1 about twice m; basal deflection of Cu_1 beyond the fork of M.

Abdomen dark brown, the caudal margin of the tergites very indistinctly paler; sternites dark brown, a little more than the caudal half of each segment pale brownish testaceous.

Hab. Cameroun.

Holotype, ♂, Lolodorf, January 28, 1919 (*J. A. Reis*). Carnegie Museum, Accession No. 6305.

Type in the collection of the Carnegie Museum.

Pseudolimnophila (*Pseudolimnophila*) *fulvipennis*, sp. n.

General coloration dark brown; mesonotal præscutum with conspicuous erect setæ; halteres light yellow; legs dark brown, the femoral bases conspicuously yellow; wings strongly fulvous; abdominal tergites light brown, narrowly trilineate with darker brown, sternites obscure yellow.

Female.—Length 10·5 mm.; wing 10·4 mm.

Rostrum and palpi dark brown. Antennæ with the scapal segments dark brown; basal flagellar segments yellow basally, becoming darker apically; remaining flagellar segments light brown, darker towards the end of the organ. Head grey, the vertex darker medially.

Pronotum dark grey, pruinose. Mesonotal præscutum dark brownish grey, the median area brown; entire surface of præscutum with conspicuous erect setæ; remainder of mesonotum dark brown; scutellum with conspicuous erect setæ; postnotum naked. Pleura dark brown, sparsely pruinose. Halteres light yellow. Legs with the coxæ dark brown, sparsely pruinose; trochanters light yellow; remainder of legs dark brown, the femoral bases broadly and conspicuously yellow. Wings with a strong fulvous tinge, more saturated, and becoming almost brown in the cells distad of the cord; stigma elongate-oval, brown; veins brown. Venation: Sc_1 ending immediately before the fork of *Rs*, Sc_2 at tip of Sc_1; *Rs* elongate, strongly arcuated at origin; R_{2+3} a little less than one-half *Rs*, rather strongly arcuated; *r* near tip of R_1; petiole of cell M_1 a little longer than the basal deflection of Cu_1, the latter at between two-thirds and three-fourths the length of cell *1st* M_2.

Abdominal tergites light brown, narrowly trilineate with darker brown; sternites obscure yellow. Genital segment obscure yellow dorsally, dark brown ventrally; valves of the ovipositor horn-coloured.

Hab. Madagascar.
Holotype, ♀, collected by Sikora.
Type in the collection of the Vienna Museum.

Pseudolimnophila (*Pseudolimnophila*) *recens*, sp. n.

General coloration light brown, postnotum and thoracic pleura sparsely pruinose; wings nearly hyaline, stigma scarcely apparent; *r* at tip of R_1 and near mid-length of R_2.

Male.—Length about 5 mm.; wing 7·2 mm.

Rostrum and palpi light brown. Antennæ short, brown, the basal scapal segment darker; first flagellar segment brightened at extreme base. Head light brown, more greyish adjoining the inner margin of eyes; head not strongly narrowed behind.

Mesonotal præscutum with three light brown, confluent stripes; humeral region and lateral margins broadly paler; pseudosutural foveæ small, oval, pale reddish; scutum and postnotum light grey pruinose; scutellum obscure yellow. Pleura light yellowish brown, sparsely grey pruinose. Halteres pale, the knobs slightly infuscated. Legs with the coxæ and trochanters pale whitish yellow; femora light brown; tibiæ brown, the tips rather broadly dark brown; tarsi brown. Wings nearly hyaline; stigma scarcely apparent; veins pale brown. Venation: Sc_1 ending opposite the fork of *Rs*, Sc_2 longer than Sc_1 and near its tip; *Rs* angulated and more or less spurred at origin; R_{2+3} approximately one-half of *Rs*, not conspicuously arcuated, about twice the basal deflection of Cu_1; *r* at extreme tip of R_1 (which is subatrophied beyond it) and just before mid-length of R_2; petiole of cell M_1 a little shorter than R_{2+3}; *m* shorter than the deflection of M_3; inner end of cell 1*st* M_2 rather conspicuously arcuated; basal deflection of Cu_1 near two-fifths the length of cell 1*st* M_2.

Abdomen light brown; a brownish-black subterminal ring; hypopygium obscure yellow. Male hypopygium with the pleural appendage broad-based, pale, the apex a short, recurved, black hook.

Hab. Madagascar.
Holotype, ♂, collected by Sikora.
Type in the collection of the Vienna Museum.

Limnophila sikorai, sp. n.

Mesonotum testaceous-yellow, thoracic pleura infuscated; halteres yellow; wings with a greyish-yellow tinge, spotted with light brown, this pattern including a series of spots at the ends of the longitudinal veins around the wing-margin ; *Rs* long, in alignment with R_{2+3} ; *r* far from tip of R_1 ; cell M_1 about as long as its petiole; basal deflection of Cu_1 at from one-fourth to one-fifth the length of cell *1st* M_2.

Female.—Length 6·8 mm. ; wing 7·1 mm.

Rostrum and palpi brown. Antennæ short, brown, the flagellar segments with a dense white pubescence. Head brown, sparsely grey pruinose.

Pronotum brownish testaceous. Mesonotum light testaceous-yellow, unmarked. Pleura infuscated, contrasting with the pale mesonotum. Halteres yellow. Legs yellowish. Wings with a greyish-yellow tinge ; stigma brown ; wing-membrane spotted with light brown, distributed as follows : Conspicuous brown clouds around the wing-margin at the ends of the longitudinal veins ; seams along the cord and outer end of cell *1st* M_2, origin of *Rs*, fork of M_{1+2} ; pale washes in the bases of cells *R* to *2nd A* and in the anal cells opposite the origin of *Rs* : cells *C* and *Sc* light yellow ; veins brown, those in the costal region paler. Venation : Sc_1 ending shortly before the fork of *Rs*, Sc_2 at its tip ; *Rs* long, gently arcuated at origin, in alignment with R_{2+3} ; R_{2+3} shorter than the basal deflection of Cu_1 ; *r* very faint, removed from the tip of R_1 to a distance a little longer than the basal deflection of Cu_1 and on R_2 about its own length beyond the fork of *Rs* ; inner ends of cells R_3, R_5, and *1st* M_2 about in alignment ; cell *1st* M_2 elongate-rectangular, slightly widened distally ; petiole of cell M_1 approximately as long as cell ; basal deflection of Cu_1 at about one-fourth to one-fifth the length of cell *1st* M_2.

Abdomen dark brown, the basal sternites a little paler. Ovipositor with the valves very long and straight, horn-coloured.

Hab. Madagascar.

Holotype, ♀, Fort Dauphin (*Sikora*).

Type in the collection of the Vienna Museum.

This interesting crane-fly is dedicated to the collector, who has discovered many interesting species of these flies in Madagascar and the Mascarene Islands. The fly should probably be referred to the genus *Pilaria*, Sintenis, rather than to *Limnophila*, and the discovery of a male specimen would presumably confirm this reference.

Eriocera evanescens, sp. n.

General coloration brownish black ; antennæ short in both sexes ; wings with a strong brown tinge, most intense along the costal region; *Sc* long, cell 1*st* M_2 relatively small, tending to be open by the atrophy of *m*; cell M_1 lacking.

Male.—Length 12 mm.; wing 11 mm.

Female.—Length 20 mm.; wing 15 mm.

Rostrum and palpi brownish black. Antennæ short in both sexes, black. Head brownish black, paler adjoining the inner margin of the eyes.

Thorax brownish black, sparsely dusted with brown. Halteres and legs brownish black. Wings with a strong brown tinge, the costal region more saturated, this intense coloration including the costal and subcostal cells and the radial region to the wing-apex; veins dark brown. Venation: *Sc* very long, Sc_1 ending approximately opposite *r*, Sc_2 some distance from the tip of Sc_1, the latter alone being about equal to the deflection of R_{4+5}; *Rs* elongate, arcuated at origin; cell 1*st* M_2 open or closed, *m* tending to be evanescent; veins beyond cell 1*st* M_2 very long and parallel; cell M_1 lacking; basal deflection of Cu_1 beyond the fork of *M*; Cu_2 and the basal deflection of Cu_1 subequal.

Abdomen black with a brown pollen. Abdomen of female relatively elongate; valves of ovipositor elongate, acicular, black, the apices of tergal valves horn-coloured.

Hab. Cameroun.

Holotype, ♂, Metet, 200 miles inland, east of Batanga, June 20, 1918 (*A. I. Good*).

Allotopotype, ♀, *in copula* with type.

Carnegie Museum, Accession No. 6317.

Type in the collection of the Carnegie Museum.

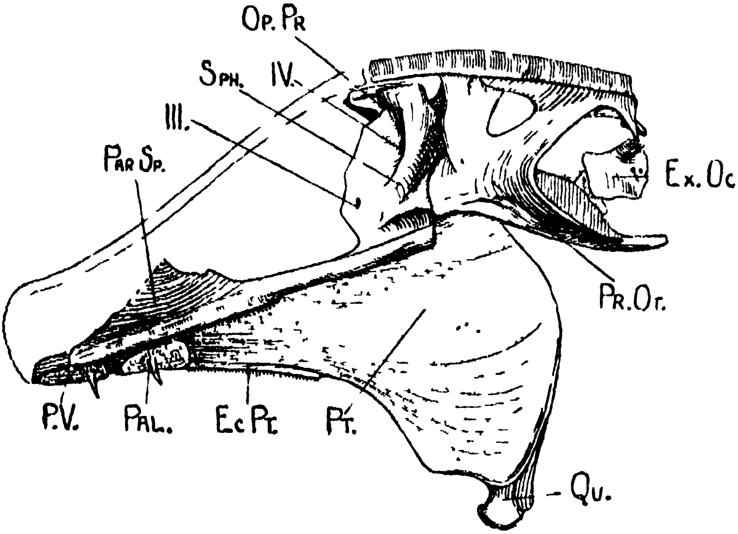
XXIX.—*On the Cœlacanth Fish.*

By D. M. S. WATSON, University College, London.

FOR some years I have been interested in Cœlacanth fish, because, although commonly included with the Osteolepids, they differ from those forms in many respects, and have in some ways marked resemblances to the Teleosts. I therefore investigated the structure of *Macropoma* in specimens partly of my own, partly lent me by Mr. G. E. Dibley, F.G.S. Whilst I was actually writing this paper I received from Dr. E. A. Stensio a copy of his great work on the 'Triassic Fishes from Spitzbergen' (Vienna, Adolf Holzhausen, 1921), which is, in my opinion, one of the most important contributions ever made to fish morphology. I find, to my great pleasure, that Dr. Stensio has been able to describe in the new genus *Wimania* nearly all the structures which occur in *Macropoma*, and that his interpretation is in nearly all points in complete agreement with that which I had reached.

In some respects, however, my material is more complete than his, and I therefore give an account of the head of *Macropoma* as an introduction to a discussion of the relationships of the group to which it belongs.

Fig. 1.



Macropoma mantelli, Ag. Lateral view of the skull, with the dermal bones and pterygoidal apparatus of the left side removed. × 1

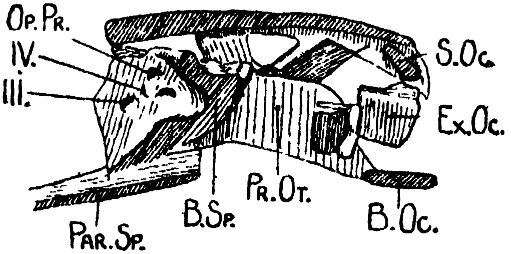
Ec.Pt., ectopterygoid; Ex.Oc., exoccipital; Op.Pr., foramen probably for the opthalmicus profundus nerve; P.V., "prevomer" and its tooth-plate; Pal., palatine tooth-plate; Par.Sp., parasphenoid; Pr.Ot., prootic; Pt., pterygoid; Qu., quadrate; III., foramen for third or sixth cranial nerve; IV., foramen for fourth cranial nerve (?).

Basioccipital.—The basioccipital is a small very thin bone, with nearly flat dorsal and ventral surfaces, which are square. It only ossified in full-grown individuals. Its anterior and posterior surfaces are free, the sides being clasped by backward projections of the prootics.

"Basisphenoid."—The "basisphenoid" is a massive ossification which has invaded the side-walls of the anterior part of the brain-case and extends up to the skull-roof.

It is a massive bone whose posterior surface is convex, and resembles a condyle in surface-structure; the rounded surface faces downwards and backwards towards the basioccipital, but is separated from that bone by a gap of more than 1 cm. The lower part of the bone in adults is massive and is covered by the hinder end of the parasphenoid. The upper surface, immediately above the condyle, is concave and has a smooth surface, which terminates at a strong rounded ridge, in front of which the bone is so deeply excavated as to consist essentially of two lateral walls. The hinder end of this excavation runs back behind the ridge, and is, without doubt, the pituitary fossa. The cavity becomes very narrow as it is traced forward, its floor contracting until the nearly straight side-walls meet in an acute angle. The side-wall of this cavity is pierced by four large foramina, three of which pass obliquely forward and outward, the fourth going dorsally. A pair of very minute foramina pierce the floor of the pituitary fossa.

Fig. 2.



Macropoma mantelli. The right side of the neural cranium and parietal in sagittal section. × 1.

Reference-letters as before, with:—B.Oc., basioccipital; S.Oc., supraoccipital.

In most individuals the lower part of the basisphenoid is unossified, so that it is not in contact with the parasphenoid in the middle line.

The outer surface of this sphenoidal element is mainly formed by two strong rounded ridges, which subside into the flat outer surface anteriorly.

The ventral ridge overhangs a deep smooth groove, running along the side of the bone immediately above the upper edge of the parasphenoid. This ridge is overlapped posteriorly by the anterior end of the prootic.

Between the upper and lower ridges is another deep rounded groove, which passes backward and is very nearly converted into a foramen by a bowing outward of the anterior edge of the prootic; the aperture so formed is regarded by Stensio as the place of exit of the facial nerve, a view which is undoubtedly correct.

The upper ridge dorsally turns forward and outward until it terminates in a rounded process, regarded by Stensio as a basipterygoid process, an interpretation which I once held, but found it necessary to abandon. This process lies close under, but is not in contact with, the skull-roof. From its inner anterior face a thin lamina—Stensio's alisphenoid—runs almost directly forward, terminating in a truncated extremity, which lies immediately below the hinder end of the frontal, but which is not fused with that bone, as it is in *Wimania*. This lamina is partially separated from the "basipterygoid" by a deep, very narrow slit.

The sphenoid is completed by a pair of very thin long walls, which arise from a feebly ossified common base lying over the parasphenoid and rise toward the roof of the skull. The external surface of each of these plates is pierced by three foramina.

Otic Region.—The lateral walls of the hinder part of the brain-case are largely formed by the great bones called prootico-opisthotic by Stensio. I prefer to call these bones prootic, because there is very little reason for believing that they include a real opisthotic.

Each consists of a body whose flat inner surface articulates with the lower ridge of the sphenoid in front and with the side of the basioccipital behind.

From the outer surface of the body posteriorly a strong ridge gradually rises as it is traced forward, until it turns dorsally and then backward, sweeping round so as to form a deep backwardly directed pocket, bounded mesially by the body of the bone. The hinder end of this ridge comes into contact and in adults fuses with a special descending flange from that dermal bone, called by Stensio the supratemporo-extrascapular. This descending flange of the supratemporal is continued forward by a deep slender ridge.

Separated from the process of the prootic above described by a V-shaped notch is another upstanding process, which rises from the outer surface of the body of the bone, so as to leave a notch which continues the middle groove on the sphenoid and gives exit to the facialis.

This process touches, and in adults fuses with, a slender descending process from the parietal, the bar so formed being separated from the hinder border of the upper part of the sphenoid by a slit.

Three other bones occur in the neural cranium of old individuals. The mutual relations of these elements is clear, but their exact position in the skull cannot be determined.

One of these bones is bilaterally symmetrical, and can only be a supraoccipital. It is known to me only from the visceral surface in one very large skull.

It is a small hexagonal bone, lightly ossified, but of considerable thickness. The dorsal surface has a considerable extension, the smooth endocranial surface being very small. It was undoubtedly separated from all other bones by a great deal of residual cartilage.

The posterior of the two remaining pairs of bones is the first of the series to ossify.

It consists of an almost square, vertically placed sheet of bone with a flat admesial surface. The upper margin of this sheet is turned outward, so that it lies horizontally. The posterior lateral corner of this region projects as a definite process of comparatively small antero-posterior width.

The vertical part of this bone is pierced near its hinder margin by two small foramina, the anterior and larger of which lies at the upper end of a deep well-defined groove.

The third element is attached to the lower two-thirds of the anterior margin of the vertical part of that just described.

It also is a mere sheet of bone standing vertically, but is placed nearly transversely in the skull. The inner border is smoothly rounded and cut out into a wide shallow bay round the brain-cavity.

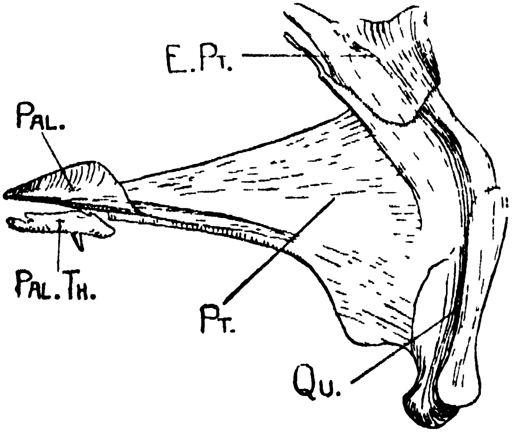
From the middle point of the upper edge of the inner surface of this bone a special very thin bony spicule arises and runs directly forward parallel to the middle line.

Palato-quadrate.—Two ossifications occur in the palato-quadrate cartilage—a quadrate and the bone called hyomandibular by most authors, which has been correctly determined by Stensio as a metapterygoid.

The quadrate is a deep slender bone, a large part of whose inner surface is covered by the pterygoid, the two bones uniting by deeply striate sutural surfaces. The quadrate stands out nearly transversely, but the inner condyle—an almost hemispherical head—lies a little in front of the cylindroid outer condyle, whose lateral surface is slightly concave.

The metapterygoid is a relatively large sheet of bone lying on the outer surface of the pterygoid. Its hinder margin is turned outward and ends dorsally in a process which touches the lower surface of the parietal. The upper border is divided into two concavities by a low elevation in the middle of its length. This general concavity surrounds the process of the sphenoid called basipterygoid by Stensio. In three cases

Fig 3.



Macropoma mantelli. Left pterygo-quadrate apparatus seen from without. × 1.

Reference-letters as before, with Pal.Th., the tooth-bearing plate attached to the palatine, represented displaced. The epipterygoid is also slightly twisted backward.

where I have removed the metapterygoid in exposing the brain-case, I have satisfied myself that there is no contact between the two elements, which are always separated by a layer of chalk and do not bear any articular facets.

The anterior end of the metapterygoid is produced into a long process of nearly cylindrical section, whose lower and part of whose admesian surfaces are supported by a long splint of bone projecting from the upper margin of the pterygoid.

Pterygoid.—The structure of the pterygoid has long been well known. It is a triangular bone, very deep posteriorly, where it extends down to the quadrate and up to the metapterygoid. Between these two bones its outer surface bears a deep groove, bounded anteriorly by a strong rounded ridge. In front of this ridge the upper border is nearly straight, lies parallel to the upper edge of the parasphenoid, and must have been very powerfully attached to that bone by a tough membrane during life, because specimens are not uncommon in which the whole skull, except the sphenoid, parasphenoid, and pterygoids, has been lost. In a specimen of this sort in my collection both metapterygoids were removed before burial without any displacement of the pterygoids.

Anteriorly the lower edge of the pterygoid turns outward, so that the oral surface of the bone becomes inclined at only a small angle to the horizontal.

The lateral margin of the pterygoid anteriorly is grooved for the reception of the ectopterygoid.

Palatine.—The palatine is a small quadricylindrical bone whose hinder end is underlain by the pterygoid. The inner part of the bone stands vertically and lies against the wall of the anterior end of the parasphenoid.

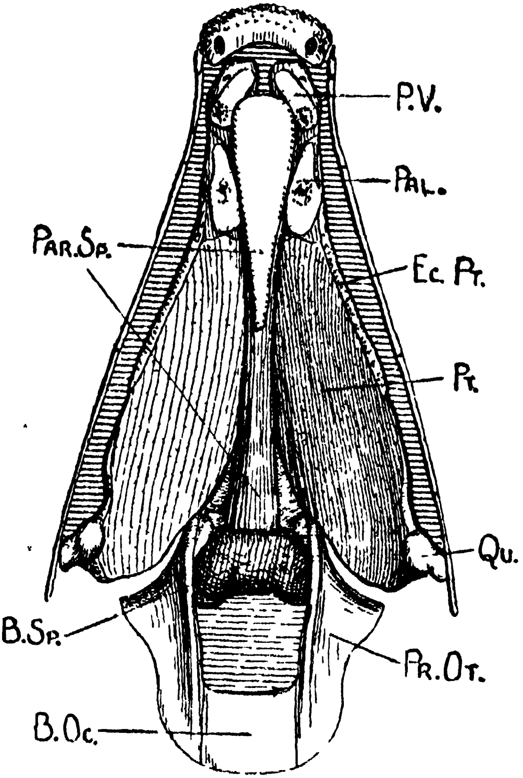
The anterior end of the bone is pointed and lies in a groove on the lateral and under surface of the bone called by Stensio a pre-ethmoid.

The palatine has no teeth attached to it, and might, if viewed in the light of teleost morphology, be regarded as an autopalatine—that is, an ossification in the palato-quadrate cartilage. The texture of the bone and the details of its suture with the pterygoid differ, however, from those of the metapterygoid, and there is really no sound reason for regarding it as other than a strict homologue of the Tetrapod palatine.

Loosely attached to the oral surface of the palatine is a thin bony plate, consisting mainly of the fused bases of a multitude of minute teeth; this element bears a single large tusk, which lies in an area, also including a shallow concavity for the development of its alternative tooth, surrounded by a circle of denticles somewhat larger than those which cover most of the bone. This element might be considered a dermo-palatine if the palatine be called auto-palatine; but, although probably homologous to that element in Teleosts, I prefer to regard it merely as a product of the fusion of teeth.

Vomer (?).—The element which for the moment I regard as a prevomer is that which is described by Stensio as a pre-ethmoid. It is a thin shell of bone consisting of an oral plate which continues that of the palatine, and is perforated antero-laterally by a small foramen; and a lateral vertical plate which anteriorly passes gradually into the oral part, but posteriorly is sharply marked off by a ridge, the lateral surface being recessed to receive the anterior edge of the palatine.

Fig. 4.



Macropoma mantelli. The palate. × 1.
Reference-letters as before. The reference-lines of P.V. and Pal. end on the tooth-plates.

The hinder end of the prevomer passes dorsally to the anterior end of the parasphenoid.

The oral surface supports a bone formed of fused tooth-bases which exactly resembles that which rests on the palatine. The large tusk is, however, placed at the caudal end.

Ectopterygoid.—The ectopterygoid is the bone which has usually been called maxilla. It is a long, very delicate element attached to a groove in the outer margins of the pterygoid and palatine. It bears a single row of small, recurved, sharp-pointed teeth, and its outer surface, which faces towards the inner surface of the suborbital, is covered with a granulation of small denticles like those on the pterygoid.

It is quite clear that this element cannot be the maxilla, because there is no evidence of the attachment of any bone to the lower margin of the suborbital.

That in B. M. N. H. no. 39070 (A. S. Woodward, pl. xxxv. fig. 10) it lies below and parallel to the suborbital is explained by the fact that the outer margin of the pterygoid is very nearly parallel to the lower edge of the suborbital in the articulated skull, and in the specimen referred to a slight inward displacement of that bone has brought the two into one plane.

Premaxilla.—The recognition of a complete series of palatal bones shows that the curious median tooth-bearing element × of Huxley's figure and Smith Woodward's vomer must be the fused præmaxillæ.

In no. 39070 and other specimens in the British Museum it stands vertically at the end of the snout, with the elongated teeth of its lower lateral corner directed downward. Its exact mode of articulation is not, however, determinable.

A Cœlacanth from the Solenhofen stone, in the Royal Scottish Museum, shows a similar premaxilla *in situ.*

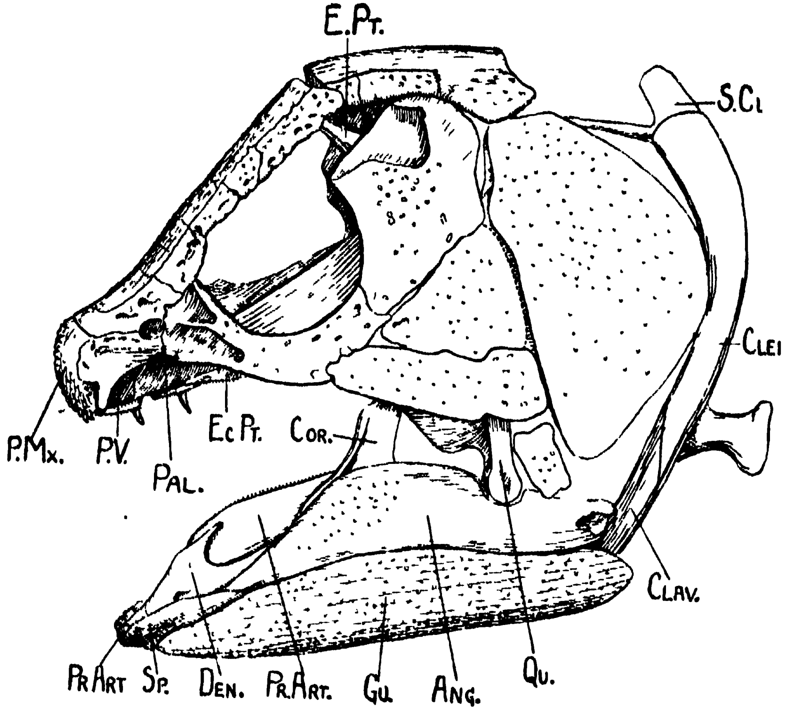
Septomaxilla (?).—Within the nasal cavity, lying freely, dorsal to the prevomers and below the dorsal surface, are a pair of bones which together form an arched roof. I know these only in transverse section, and can give no account of their shape. They may be true septomaxillæ, but are more probably ossifications in the ethmoidal cartilages.

Dermal Bones of the Outer Surface of the Head.—The general shape of the parietals is well known. They terminate anteriorly in a transverse margin whose edge is rounded, entirely unlike a suture and always separated from the similar hinder edge of the frontal by a space.

There is, in fact, no doubt possible that the Cœlacanths had a movable joint between these two bones, which were in life connected by a ligament.

The produced postero-lateral corners of the parietal plate are not in any specimens I have seen separated by distinct sutures, but as they are not present in three young individuals of my series, they are no doubt in origin separate bones,

Fig. 5.



Macropoma mantelli. Reconstruction of the right side of the anterior end of the fish. × 1.

Reference-letters as before, with:—Ang., angular; Clav., clavicle; Clei, cleithrum, Cor., coronoid; Den., dentary; E.Pt., epipterygoid = metacoracoid; Gu., gular; Pr.Art., prearticular; S.Cl., supracleithrum; Sp., splenial. The small tooth-bearing bones above the prearticular and dentary are described in the text.

called by Stensio supratemporo-extrascapula. For the present I shall call them supratemporals.

The supratemporal has projecting from its lower surface a ridge which is produced caudally into a descending point and anteriorly into a lamina which fuses with the prootic. The bone terminates in a transverse suture with the last of the parafrontals at a point behind the middle of the parietal. In front of this spot the parietal is continued out laterally as a thin shell of bone, which in the articulated skull is completely concealed by the two posterior parafrontals. From the lower surface of this part of the parietal a descending process reaches, and in adults fuses with, the prootic.

As has long been known, the narrow frontals of *Macropoma* are continued forward by a series of small square elements, which seem to be either four or five in number in different individuals.

From the lateral borders of the lower surface of these elements and of the frontals thin flanges of bone pass outward below the parafrontals.

The parafrontal series of bones begin at sutures with the supratemporals, and continue forward as straight rows lying on the flanges of the parietals, frontals, and preceding bones until they turn inward and meet in the middle bone immediately behind the premaxillæ.

The number of parafrontals in each row is extremely difficult to determine, and appears to be variable in different individuals; it is of the order of ten.

There may be a median parafrontal in the front (Stensio's inter-rostral), and the second of the paired series (Stensio's nasalo-antorbital) is always large, although in *Macropoma* it is never perforated by narial openings.

Attached to the lateral margin of this large second parafrontal is a remarkable and very characteristic bone, which can be recognized in *Undina*. This bone stands nearly vertically on the side of the face. Its anterior border is vertical and no doubt supported the hinder edge of the premaxilla. The lower border is produced downwards into a long slender process, which ends freely and perhaps separated the two nasal apertures.

Above and caudally to the process the outer surface of the bone is depressed and is smooth, in marked contrast to the extremely rough dorsal part and parafrontals.

The hinder end of the suture between this bone and the parafrontal with which it articulates is widened out into a large nearly circular hole, which, as it continues one of the deep grooves on the suborbital, is certainly merely for part of the lateral line apparatus.

The suborbital is already well known and sufficiently shown in fig. 5. Anteriorly it articulates with two parafrontals and with the undetermined bone described above. Just behind its articulation it is excavated by two deep channels, which plunge down into the bone.

The postorbital and other cheek-plates are sufficiently explained by fig. 5.

There is, however, in one of my specimens and in B. M. N. H. no. 49834 a small bone covered with "denticles" like a scale lying below the quadrato-jugal and in front of the lower end of the operculum.

Lower Jaw.—The lower jaw has been already well described by Smith Woodward. The long straight prearticular extends forward from the hinder end to the symphysis, where it meets its fellow as a massive rounded bone on the dorsal surface of the jaw.

The articular and the postglenoid ossicles have already been described by Smith Woodward, although in my specimen they are not visibly separated by sutures from the angular. The dentary, splenial = infradentary, and coronoid are also well known.

I find, however, that the dentaries do not quite meet at the symphysis; they are separated by the prearticulars for a space of about 8 mm. in a large skull.

The upper surface of the prearticular and dentary for a distance of about 1 cm. from the symphysis is covered by a series of three small bones built up of fused tooth-bases. The anterior of these, at any rate, supports a single larger tusk on its posterior surface.

The opercular apparatus and shoulder-girdle are so well known as to require no further description.

Shape of Head.—Specimens of *Macropoma* are in general only very slightly distorted. The height of the skull is fixed very definitely by the pterygoidal apparatus, which extends from the quadrate to the skull-roof. The width of the head can be determined with considerable accuracy, because the gulars obviously, as in *Polypterus*, fill up the whole space between the rami of the lower jaw. In transverse section each gular is bent round very nearly for a quadrant of a circle; when placed together in natural position the ventral surface is horizontal, and in section there is a smooth transition into the vertical lateral surface of the angular—in fact, the section between points at about half the height of the angulars is rather accurately semicircular.

This fixes the position of the lower jaws, and that of the pterygoids and sides of the face follows directly.

The anterior end of *Macropoma* so reconstructed is very deep and remarkably narrow, differing considerably from the much more usual shape of *Wimania* and *Alexia*.

General Discussion of the Cœlacanth Skull.

Although in general I accept Dr. Stensio's interpretation of the Cœlacanth skull, I am unable to concur in some of the identifications he makes.

A term like supratemporo-extrascapularis. implies that there has been an actual fusion of bones, and that we should expect to find that. the bone so called develops from two centres. That this is so there is no evidence in the case of any bone which Stensio calls by a name of this type.

The evidence on which he relies is simply that the bone in question covers an area which in a more primitive form is covered by two or more bones.

If this mode of interpretation were carried to its logical conclusion, one would have to call the parietal of such a mammal as lemur a parieto-post-fronto-postorbital, because it occupies an area which in a Gorgonopsid is filled by these three independent bones. It is, however, quite certain from its development that the mammalian parietal is single, and we have series of Anomodont reptiles which show a steady reduction in size of the postfrontal until that bone is represented by an extremely minute strip partially separating the parietal and postorbital.

In reptiles, at any rate, there can be no doubt that the normal way in which the number of membrane-bones in the skull is reduced is not by the fusion of neighbouring bones, but by a gradual reduction in size and final loss of one of them.

It seems to me most probable that this method of loss is that which usually occurs in bony vertebrates, and as a general policy I have always of recent years regarded a bone as single and corresponding to a single bone in an ancestor, unless there is very good direct evidence that it is formed by fusion of two or more bones.

That such fusions do sometimes occur is certain ; in this paper I record a fusion taking place quite late in development between the parietal and supratemporal of *Macropoma* and the formation of the interparietal in mammals by the fusion of a pair of bones is familiar to everyone.

Thus, until he adduces direct evidence that they are formed by fusion, I am unable to accept any of Dr. Stensio's compound names of bones.

The prearticular of *Macropoma* corresponds exactly to that bone in *Megalichthys*; in both they form the greater part of the inner surface of the jaw and in both they meet at the symphysis.

The dentary of Cœlacanths is undoubtedly correctly determined.

The three little tooth-bearing bones which rest on the upper and lingual surfaces of the anterior ends of the prearticular and dentary are interpreted by Stensio as precoronoids. This view cannot be accepted; their relation to the bones on which they rest are quite different to those held by the precoronoids in Osteolepids and Tetrapods, and they are much further forward than those bones ever are.

They can, it seems to me, be most usefully interpreted as new formations, formed by the fusion of teeth. They agree with the little tooth-bearing plates which occur on the copula in *Macropoma* and on the branchial arches in other Cœlacanths, which are certainly neomorphs.

The coronoid of Cœlacanths is certainly that bone, and the angular, although incapable of certain determination, is one of the three posterior infradentaries.

Palate.—The pterygoid of *Cœlacanthus* is extremely similar in its relation to the pterygoid of Osteolepids and Labyrinthodontia, and is determined with certainty.

The metapterygoid, certainly an ossification on the palatoquadrate cartilage, is analogous and probably homologous with the metapterygoid. It agrees closely with one of the continuous series of ossification which occurs in the cartilage in Osteolepids and rather strikingly with the epipterygoid of an Embolomerous Labyrinthodont which I am describing shortly.

There can be no doubt that the bay in its upper edge transmitted the maxillary and mandibular divisions of the fifth nerve, and that the ophthalmicus profundus passed out in front of it.

These relations, considered in connection with the absence of any direct contact with the sphenoid, show that the so-called basipterygoid is not necessarily that process.

The palatine is considered by Stensio as an autopalatine—a substitution-bone; this view is founded presumably on the fact that it does not support teeth directly. In *Macropoma*, however, it has not the appearance of a cartilage-bone, and the fact that the teeth are attached to a separate element does not provide conclusive evidence, because this bone is identical in type with the tooth-bearing bones of the front of the lower jaw and visceral arches, which we have seen to be neomorphs without morphological importance. At the same time, I think it probable that we have in *Macropoma* the beginning of the process which results in Teleosts in the production of an auto- and a dermo-palatine: all I wish to make clear is that the palatine of Cœlacanths is not to be regarded as an original ossification in the palato-quadrate cartilage.

The so-called pre ethmoid of Cœlacanths resembles in structure the palatine, with which it articulates, and, like that bone, supports a tooth-plate. In position on the palate and in the associated teeth it recalls the prevomer of an Osteolepid. I am extremely doubtful of its being an ossification on the nasal capsule, and prefer to regard it as a prevomer, fully recognizing that it is very unusual in passing on to the dorsal surface of the parasphenoid, in extending so far dorsally over the side of the olfactory capsule, and in its perforation by a foramen.

The ectopterygoid is identified without difficulty.

The accurate determination of the homologies of the dermal bones of the outer surface of the head in Cœlacanths seems to me at present impossible. Only in *Osteolepis*, *Megalichthys*, *Eusthenopteron*, and *Dictyonosteus* is the structure of the snout known at all. In *Osteolepis* and *Megalichthys*, where I have been able to examine considerable numbers of good specimens, the number and arrangement of the bones in the anterior region of the skull vary enormously; in the latter genus especially they are seldom symmetrical, and I prefer not to attach independent names to them.

The skull of *Eusthenopteron* represented in Stensio's fig. 57 differs very greatly from Bryant's restoration, which is borne out by his photographic plates, and in the passage of the supratemporal cross-commissure of the lateral line apparatus over the tabulare and interparietal differs from all Osteolepid skulls I have ever examined.

Macropoma clearly presents a multiplication of dermal bones, and is not a favourable subject for study; but I think it probable that the peculiar bone with a downwardly directed process and the second paired parafrontal are separated parts of Stensio's nasalo-antorbital, and that the process separated the two narial apertures.

One of the most striking characters of the Cœlacanth skull is the hinge between the parietals and frontals, which is in *Macropoma* continued outwards between bones of the parafrontal series.

This hinge is exactly similar to that which occurs in an identical position in all Osteolepids, and by itself goes far to establish a derivation of the Cœlacanths from that group.

In a paper now ready for publication I have pointed out that the long unossified region which separates the basisphenoid and basioccipital of Osteolepids, as shown in Bryant's description of *Eusthenopteron*, is functionally connected with the hinge in the dorsal roof of the head.

The neural cranium of Cœlacanths is very difficult to interpret. Dr. Stensio is, of course, perfectly correct in his interpretation of the "sphenoid." It is probable that the most dorsal foramen passing through that bone is for the opthalmicus profundus, and that the lower and most anterior of these transmitted the third or sixth nerve. The remaining foramen may have transmitted the trochlearius.

I am very doubtful of Stensio's interpretation of the space between the basisphenoid and parasphenoid as a myodome. In *Macropoma* the basisphenoid fades away gradually until it is represented only by bony spicules. In different individuals there is some evidence that there is a progressive growth of bone into this region, and the conclusion seems obvious that it was in life occupied by cartilage which failed to ossify. The basisphenoids of *Macropoma*, *Wimania*, and *Axelia* are much less completely ossified than those of the Coal Measure and Upper Permian Cœlacanths. In these forms the hinder surface of the basisphenoid is formed by a large, nearly circular, concave condyle, extended laterally and upward by small additional faces; it is entirely identical with that of *Megalichthys*. In these forms it is most probable that the lower surface of the basisphenoid is in direct contact with the parasphenoid.

In any case, the position of this hole is not that of the Palæoniscid myodome which lies dorsal to the basipterygoid process and lateral of the body of the basisphenoid.

The large bone called by Stensio the prootico-opisthotic corresponds most accurately with the prootic in *Eusthenopteron* (Bryant, 1919). The two bones agree in articulating with the lateral borders of the basioccipital, and stretching forward in front of that bone along the sides of the great unossified tract of the basis cranii. In Osteolepids they do not reach the basisphenoid as they do in Cœlacanths. In both forms there are anterior and posterior flanges from the skull-roof which meet or nearly meet the upper edge of the prootic. The two bones differ, however, in the absence in *Eusthenopteron* of the pocket which occupies the hinder part of the side of the Cœlacanth prootic. The function of this pocket is not clear to me, but it may have surrounded the labyrinth, the outer side of the otic capsule having been unossified.

Another important difference is that whilst a foramen for the seventh nerve passes through the prootic in *Eusthenopteron*, that of Cœlacanths is imperforate.

These comparisons show that Dr. Stensio is correct in finding the points of exit of the seventh and fifth nerve between the sphenoid and prootic. Consideration of the position of the metapterygoid shows that he is probably also correct in placing the latter nerve very high up.

Of the other three elements of the brain-case, one—the supraoccipital—is homologous with the ossified supraoccipital region of *Megalichthys*. The large posterior paired element agrees closely with the exoccipital of *Eusthenopteron*, the foramina piercing it being for two occipital nerves—that is, essentially for a hypoglossus. The remaining element may probably be an opisthotic.

Thus a fuller knowledge confirms the close similarity between the neural crania of Osteolepids and Cœlacanths which Dr. Stensio has shown to exist.

The curious unossified region of the basis cranii and the hinge in the dorsal surface which is functionally connected with it are not known in any early bony vertebrates except these forms; they are specializations which are specific to the Osteolepids, and were developed in those fish after their separation from the Amphibian, Dipnoan, and Actinopterygian stocks.

The occurrence of these features in a typical form in Cœlacanths seems, in my eyes, almost conclusive evidence of a descent from Osteolepids.

Such descent allows us to draw most important conclusions as to the kinds of structures which may be found in fish derived from the Osteolepids.

As Stensio has pointed out, we have in Cœlacanths a complete loss of the hyomandibular as a supporting element of the jaw. This loss is an exact parallel to that which has occurred in Tetrapods and Dipnoi.

We have a separation of the teeth from the bones to which they were formerly attached and their fusion into independent ossicles, which is exactly parallel to that which occurs in many Actinopterygians (e. g., *Amia*).

We have a great reduction or loss of the external tooth-supporting bones analogous to that of Dipnoi and certain Urodeles.

This comparison lends additional support to the view, so much used by Dr. A. S. Woodward, that in evolution the dermal fin-rays become correlated with the endoskeletal fin-supports.

Finally, as all Osteolepids have an archipterygial fin, with only a single element articulating with the pectoral girdle, we have to take into consideration the somewhat Teleost-like skeleton of the pectoral fin found in *Cœlacanthus* according to Wellburn and in an undetermined Cœlacanth described by Smith Woodward.

The whole literature is listed and discussed in E. A. Stensio, 'Triassic Fishes from Spitzbergen' (Adolf. Holzhausen, Vienna, 1921).

I have to acknowledge my indebtedness to Mr. G. E. Dibley for the loan of specimens, two of which proved invaluable in my studies.

XXX.—*On the Genus* Lasiodora, *C. Koch.* By MELLO-LEITÃO, M.D., Fellow of the Brazilian Society of Sciences.

THE genus *Lasiodora*, C. Koch, is essentially neotropical, and all its species but one (*L. weijenberghi*, Thorell, from Argentina) are found in the Brazilian fauna. I have seen in the collection of the Natural History Museums of S. Paulo and Rio de Janeiro specimens of all the Brazilian species.

Lasiodora differs from all the other Lasiodoreæ, Simon, in having a stridulating-organ similar to that of *Grammostola*; but in *Lasiodora* the stridulating bristles are much less numerous, and those on coxa i. are situated only upon the suture. The characters of this stridulating-organ distinguish the species, the number and disposition of the stridulating bristles being variable. I give the following table of Brazilian species:—

A. Falces with a rose-thorn-like spur in the external surface .... *acanthognatha*, sp. n.
AA. Falces without external spur.
  B. Stridulating-organ with only three large bristles upon the suture on coxa i. .. *dulcicola*, sp. n.
  BB. Stridulating-organ with more than seven bristles upon the suture on coxa i.
    C. Stridulating-organ with some short stout spines on the anterior side of coxa i. amongst the stridulating bristles (median anterior eyes larger than laterals).

D. Anterior lateral eyes larger than posteriors.

E. Inner surface of the tibiæ of palps with eleven spines in three longitudinal species .... *marianna*, sp. n.

EE. Inner surface of the tibiæ of palps with 2–3 spines .... *citharacantha*, sp. n.

DD. Posterior lateral eyes as large as the anteriors.

E. Stridulating-organ consisting of seven large distally duller bristles; patella and tibia i. as long as iv. .... *cryptostigma*, sp. n.

EE. Stridulating-organ consisting of more than twelve incrassate distally pink bristles; patella and tibia i. longer than iv..... *fracta*, sp. n.

CC. No spines amongst the stridulating bristles on coxa i.

D. Posterior legs four times longer than the carapace; patella and tibia i. or iv. longer than the carapace.

E. Anterior median eyes larger than laterals .... *subcanens*, sp. n.

EE. Anterior median eyes smaller than laterals.

F. Posterior medians much smaller than anterior medians; twelve large plumose stridulating bristles upon the suture on coxa i.

G. Legs with pale longitudinal dorsal lines .... *klugii* (Koch).

GG. Legs without pale lines.. *difficilis*, sp. n.

FF. Posterior medians about as large as anterior medians.

G. Stridulating-organ consisting of eight incrassate but apically attenuate bristles on coxa i. upon the suture .... *striatipes* (Ausserer).

GG. Stridulating-organ consisting of very many (even more than twelve) plumose bristles, almost coming to distal border, on coxa i. upon the suture. *curtior*, Chamberlin.

DD. Posterior legs less than four times longer than the carapace, which is longer than or as long as patella and tibia iv.

E. Anterior median eyes distinctly larger than laterals (stridulating-organ consisting of very many plumose bristles) ...... *erythrocythara*, sp. n.

EE. Anterior eyes equal or the medians smaller than laterals
  F. Cephalothorax distinctly shorter than patella and tibia i.
    G. Cephalothorax slightly longer than patella and tibia iv.; eyes of the anterior row subequal, separated from each other by less than one diameter . . *differens*, Chamb.
    GG. Cephalothorax as long as patella and tibia iv.; anterior median eyes much smaller than laterals and about two diameters apart.
      H. Sternum about as wide as long . . . . *pleoplectra*, sp. n.
      HH. Sternum much longer than wide (9·5×6 mm.). *dolichosterna*, sp. n.
  FF. Cephalothorax as long as or slightly longer than patella and tibia i.
    G. Posterior lateral eyes about as large as anterior laterals. *parahybana*, Mello-Leitão.
    GG. Anterior lateral eyes distinctly larger than posterior laterals.
      H. Stridulating-organ consisting of ten plumose bristles, disposed in three vertical files, touching the suture on coxa i. . . . . *spinipes* (Ausserer)
      HH. Stridulating-organ on coxa i. consisting of seven bristles, in a single file, separated from the suture by a bare longitudinal band . . . . *itabunæ*, sp. n.

1. *Lasiodora acanthognatha* *, sp. n.

♀.—45 mm.; ceph. 19×17 mm.; legs 63–58–56–68 mm.; patella+tibia i. 23 mm., iv. 22 mm.

Carapace, falces, and legs brown-olive, the carapace with some short golden hairs in the cephalic area; falces and legs with long, distally slight, rosy bristles, sternum and coxæ paler. Abdomen more velvety black above, with fine, long, orange bristles.

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* *ἄκανθα*, thorn, *γναθος*, jaw — an allusion to the thorn-like apophysis of the falces.

Carapace low, longer than wide, shorter than patella and tibia i. or iv., slightly longer than protarsus iv.; fovea deep, transverse. Eyes of the anterior row strongly procurved, the anterior edge of the medians being a little behind the centre of the laterals, the medians being the smaller, more than a diameter apart and separated from the laterals by about a diameter; posterior medians about as large as the anterior medians, not very widely separated from them, closer to posterior laterals, which are smaller than the anterior laterals and separated from them by a space which is quite equal to half a diameter of the latter.

Falces with a thorn-like spur on the apical third of the external surface; fang-groove with eleven teeth on inner margin, the basal one granuliform. Posterior sternal sigillæ separated from the margin by less than their long diameter.

Protarsus i. and ii. scopulated almost to base; protarsal scopula iii. covering ½, with two basal spines; iv. covering about ⅓—elsewhere strongly spined. Tibia i. with two short apical spines; ii. with three apical and one inferior spines; iii. with four apical, two inferior, and 1–1 anterior; iv. with two apical, 1–1 inferior, and 2–1 posterior spines.

Hab. S. Paulo.

Type in my own collection.

2. *Lasiodora dulcicola**, sp. n.

♀.—48 mm.; ceph. 22·5 × 21·5 mm.; legs 66–62–60–73 mm.; patella + tibia i. 24·5, iv. 23·5 mm.

Carapace, chelæ, legs, sternum, and labrum mahogany-brown; coxæ of the pedipalps slightly paler. Legs with abundant sulphur-yellow bristles. Coxæ of pedipalps and margins of fang-groove with more yellowish and paler bristles than usual. Abdomen narrower than carapace, velvety black, with large light yellow bristles.

Carapace almost as wide as long, shorter than patella and tibia i. or iv.; fovea deep, transverse. Eyes of the anterior row strongly procurved, the anterior edge of the medians being a little behind the centre of the laterals, nearly evenly spaced, the medians being much the smaller and separated from each other by a space which equals their diameter; posterior medians about as large as the anterior medians, not very widely separated from them, closer to posterior laterals, which are smaller than the anterior laterals and separated from them by a space which is quite equal to the long diameter of the latter.

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* Named after its habitat, the Doce River.

Fang-groove with eleven teeth on inner margin, nearly evenly spaced.

Stridulating-organ consisting of only three large, simple, incrassate, but apically attenuate bristles upon the suture on coxa i.

Protarsal scopula of i. and ii. covering the segment almost to base, iii. covering $\frac{1}{3}$, and iv. tied up at apex.

Hab. Rio Doce (Espirito Santo).

Coll. E. Garbe. Type in the S. Paulo Museum (no. 142).

3. *Lasiodora mariannae**, sp. n.

♂.—55 mm.; ceph. 23 × 20 mm.; legs 75–71–65–82 mm.; patella + tibia i. 25 mm., iv. 28 mm.; protarsus iv. 23 mm.

The whole spider pitch-black; the legs and abdomen with large black-fulvous bristles. Sternum and coxæ dark rusty brown. Coxæ and margins of fang-groove with fiery-red bristles.

Carapace longer than wide, shorter than patella and tibia i. or iv., as long as protarsus iv.; fovea deep, right transverse.

Eyes of the anterior row procurved, the anterior edges of the medians being on a level with the centre of the laterals, nearly evenly spaced, the medians being much the smaller, separated from each other by about two diameters; posterior medians much smaller than the anterior medians, close to posterior laterals, which are smaller than the anterior laterals and separated from them by less than the long diameter of the latter.

Fang-groove with twelve teeth $(4+5+1+1+1)$ on inner margin—six large and six very small.

Stridulating-organ consisting of large plumose bristles, with short stout spines among them, but without clavate bristles intermingled.

Spurs of tibia i. well developed, the upper stout, straight, cylindrical, blunt, and bearing a long sinuous spine on its underside; the lower crescently cylindrical, curved at the apical third; protarsus i. distinctly bowed at its proximal end.

Protarsus i. and ii. scopulated almost to base. Tibiæ of pedipalps with eleven spines, disposed in three longitudinal series, on the inner surface.

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* Named after its habitat—Marianna, a town in Minas Geraes.

♀.—55 mm.; ceph. 22 × 20 mm.; legs 60–53–44–64 mm.; patella + tibia i. 22 mm., iv. 21 mm.

Colour, eye-disposition, and stridulating-organ as in the male.

Carapace as long as patella and tibia i. and slightly longer than patella and tibia iv. Legs shorter and stronger. Protarsus i. terete, shorter than tibia.

Hab. Marianna (Minas Geraes).

Coll. Dr. Godoy. Type in the S. Paulo Museum (no. 151).

4. *Lasiodora citharacantha* *, sp. n.

♀.—57 mm.; ceph. 21 × 19 mm.; legs 67–62–57–72 mm.; patella + tibia i. 24 mm., iv. 22·5 mm.

Integument of the carapace brown-red, with blackish dusky clothing of short hairs; falces and legs mahogany-brown, with abundant curly brick-red bristles. Abdomen velvety black, with very abundant long pink bristles. Sternum and coxæ mahogany-brown.

Cephalothorax longer than wide, shorter than patella and tibia i. or iv. Eyes of the anterior row strongly procurved, the anterior edge of the medians being a little behind the centre of the laterals, nearly evenly spaced, the medians being the smaller, separated from each other by a space which equals their diameter; posterior medians not much smaller than the anterior medians, closer to the posterior laterals, which are smaller than the anterior laterals, and separated from them by a space which surpasses the long diameter of the latter.

Stridulating-organ consisting of seven plumose bristles, disposed in two longitudinal series, and of five proximal spines beneath them.

Protarsal scopula i. and ii. covering the segment almost to base; iii. covering ⅔, with one spine at its base; iv. covering about ⅕—elsewhere strongly spined. Tibia i. with 1 apical spine; ii. with 3 apical; iii. with 2 apical, 2 inferior, 1–1–1 anterior and 1–1–1 posterior; iv. with 2 apical, 1–2 inferior, 1–1 anterior, and 1–1–1 posterior spines.

Hab. S. Paulo.

Type in my own collection.

5. *Lasiodora cryptostigma*, sp. n.

♀.—63 mm.; ceph. 24 × 22 mm.; legs 68–62–60–73 mm.; patella + tibia i. 24 mm., iv. 24 mm.

The whole spider dusky black; the large bristles of the falces and the legs with yellow-brown; those of the abdomen brick-red. Sternum, coxæ of the legs, and the abdomen below chestnut-black.

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* *κίθαρα*, lute; *ἄκανθα*, spine.

Carapace longer than wide, as long as patella and tibia i. or iv.; fovea deep, transverse. Eyes of the anterior row slightly procurved, the anterior edge of the medians being a little before the centre of the laterals, the medians being the smaller, nearly a diameter apart, and separated from the laterals by more than 1¼ diameter; posterior medians about as large as the anterior medians, close to the posterior laterals, which are about as large as the anterior laterals and separated from them by a space which is quite equal to the long diameter of the latter.

Fang-groove with fourteen teeth on the inner margin, the distal three close to the fang-base.

Stridulating-organ on coxa i. consisting of seven large plumose bristles upon the suture, intermixed with five spines irregularly disposed. Sternum slightly longer than wide, with little, almost obsolete, submarginal posterior sigillæ.

Protarsus i. and ii. scopulated nearly to base; iii. on ⅔; and iv. with little distal scopula. Tibia i. with 2 apical spines; ii. with 2 apical, 1 inferior, and 1–1 anterior; iii. with 4 apical, 2–2 inferior, 1–1 anterior, and 1–1 posterior; iv. with 2–2–1 anterior, 2–2–2–2–2 inferior, and 1–1–1–2–1 posterior spines.

Hab. S. Paulo.

Type in my own collection.

6. *Lasiodora fracta* *, sp. n.

♀.—55 mm.; ceph. 24 × 22 mm.; legs 70–65–62–78 mm.; patella + tibia i. 25 mm., iv. 24 mm.

The whole spider dusky black, with the large bristles of the falces, legs, and abdomen dark brown. The bristles of the coxæ of pedipalps and margins of the fang-groove fiery red.

Cephalothorax longer than wide, shorter than patella and tibia i., as long as patella and tibia iv. Eyes of the anterior row slightly procurved, the anterior edge of the medians being a little before the centre of the laterals, nearly evenly spaced, the medians being the smaller, separated from each other by a space which equals their diameter; posterior medians much smaller than the anterior medians, but not very widely separated from them, closer to posterior laterals, which are about as large as the anterior laterals and separated from them by a space which is quite equal to the long diameter of the latter.

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* Broken.

Posterior sternal sigillæ conspicuous, submarginal.

Stridulating-organ on coxa i. consisting of more than twelve plumose bristles, with pink tips, and of four spines beneath.

Protarsus i. and ii. scopulated nearly to base; iii. at apical $\frac{2}{3}$; iv. only at apex. Tibia i. with 1 apical spine; ii. with 2 apical, 1 inferior and 1 posterior; iii. with 2 apical, 2 inferior, 1–1–1 anterior, and 1–1 posterior; iv. with many apical, 1–2 inferior, 1–1 anterior, and 1–1–1 posterior spines.

Hab. Bahia.

Coll. Dr. Olympio da Fonseca Filho.

Type in my own collection.

7. *Lasiodora subcanens* *, sp. n.

♂.—55 mm.; ceph. 24 × 23 mm.; legs 92–93–85–99 mm.; patella + tibia i. 33 mm., iv. 32 mm.; protarsus iv. 27 mm.

Integument of the carapace dark red, with a mouse-greyish clothing of short hairs; falces with large greyish bristles. Sternum and coxæ fulvous blackish. Coxæ of pedipalps and margins of fang-groove with fiery-red bristles. Abdomen below wholly black. Legs with very abundant and very large bristles with dark chestnut-brown bases and pale greyish tips, and with pale lines of short hairs. Abdomen dusky black, with large bristles, dark chestnut-brown below and fulvous testaceous at the tips.

Cephalothorax about as wide as long, much shorter than patella and tibia i. or iv. and than protarsus iv.

Ocular tubercle very high, much wider than long. Eyes of the anterior row strongly procurved, the anterior edge of the medians being a little behind the centre of the laterals, nearly evenly spaced, and a little unequal in size, the medians being the larger, and separated from each other by a space which equals their diameter; posterior medians almost as large as the posterior laterals and nearly evenly separated from them and from the anterior medians; posterior laterals as large as the anterior laterals, less than a long diameter apart.

Stridulating-organ consisting of eight or nine plumose bristles, disposed on coxa i. in two transverse series, without spines and without bacilliform bristles.

Protarsal scopulæ of soft mouse-grey hairs; i. and ii. covering the segment nearly to base; iii. covering $\frac{2}{3}$, with three spines at its base; iv. covering about $\frac{1}{6}$—elsewhere strongly spined.

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* Of greyish hairs.

Spurs of tibia i. well developed, the upper stout, straight, cylindrical, blunt, and bearing three long sinuous spines obliquely ranged on its underside; the lower crescently cylindrical, slightly curved to the inner border.

Hab. Rio Doce (Espirito Santo).

Coll. E. Garbe. Type in the S. Paulo Museum (no. 132).

8. *Lasiodora klugii* (Koch).

Mygale klugii, C. Koch, 1842, Die Arachniden, vol ix. p. 25, pl. ccxcv. fig. 708.

Lasiodora klugii, C. Koch, 1850, Uebersicht d. Arach. Syst. vol. v. p. 72.

Lasiodora klugii, Ausserer, 1871, Verh. zool.-bot. Ges. Wien, vol. xxi. p. 209.

Lasiodora klugii, Simon, 1892, Hist. Nat. Ar. vol. i. p. 161.

Lasiodora klugii, Pocock, 1901, Ann. & Mag. Nat. Hist. ser. 7, vol. viii. p. 544.

Lasiodora klugii, Strand, 1907, Jahres. Vereins vaterl. Naturk. Wurttemberg, vol. lxiii. p. 54.

Lasiodora bahiensis, Strand, 1907, id. ibid. p. 57.

Lasiodora klugii, Petrunkevitch, 1911, Bull. Amer. Mus. Nat. Hist. vol. xxix.

Lasiodora klugii, Strand, 1912, Wiesbaden Jahrb. nassau. Ver. Naturk. p. 175.

Hab. Bahia, where it is the most common Aviculariid. I have seen some typical specimens, and I believe *Lasiodora bahiensis*, Strand, to be synonymous with *Lasiodora klugii* (C. Koch).

9. *Lasiodora difficilis* *, sp. n.

♂.—57 mm.; ceph. 25 × 25 mm.; legs 92–88–81–100 mm.; patella + tibia i. 31 mm., iv. 31 mm.; protarsus iv. 27·5 mm.

Integument of the carapace dark red, with a blackish-grey clothing of short hairs, and with large marginal red hairs; falces dusky black, with yellowish bristles; legs dusky black, with very abundant large ochraceous bristles; sternum and coxæ dusky brown. Abdomen with such abundant fiery-red bristles as almost to conceal its velvety-black clothing.

Carapace as wide as long, much shorter than patella and tibia i. or iv. and than protarsus iv. Eyes of the anterior row very slightly procurved, the anterior edge of the medians being much before the centre of the laterals, nearly evenly spaced, the medians being much the smaller and separated from each other by a space which surpasses their diameter;

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* Hard, difficult.

posterior medians much smaller than the anterior medians, but not very widely separated from them, closer to posterior laterals, which are much smaller than the anterior laterals and separated from them by a space which is quite equal to the long diameter of the latter.

Fang-groove with ten teeth on inner margin. Posterior sternal sigillæ very conspicuous, submarginal.

Stridulating-organ consisting of twelve large plumose bristles on the suture, on coxa i., and no spines or claviform bristles.

The soft hairs of the scopula are basally pale and distally black; protarsal scopula i. and ii. covering the segment nearly to base; iii. covering ⅔, with two spines at its base; iv. covering about ⅓—elsewhere strongly spined.

Spurs of tibia i. well developed, the upper straight, blunt, bearing three sinuous spines on its underside; the lower crescently cylindrical, curved, blunt.

♀.—60 mm.; ceph. 25 × 24 mm.; legs 75–67–65–80 mm.; patella + tibia i. 25 mm., iv. 25 mm.

Colour as in male. Carapace slightly longer than wide, as long as patella and tibia i. or iv. The anterior row of eyes a little more procurved. Stridulating bristles as in male.

Hab. S. Paulo.

Coll. Mr. Cleophas. Type in the S. Paulo Museum (no. 139).

10. *Lasiodora striatipes* (Ausserer).

Eurypelma striatipes, Ausserer, 1871, Verh. zool.-bot. Ges. Wien, vol. xx. p. 212, pl. i. figs. 15, 16.

Lasiodora striatipes, Ausserer, 1875, Verh. zool.-bot. Ges. Wien, vol. xxv. p. 190.

Lasiodora striatipes, Simon, 1892, Hist. Nat. Ar. vol. i. p. 161.

Hab. Ausserer only gives Brazil as habitat. I have seen, in the collections of the S. Paulo Museum, specimens from S. Paulo and Bahia.

11. *Lasiodora curtior*, Chamberlin.

Lasiodora curtior, Chamberlin, 1917, Bull. Mus. Comp. Zool. Harvard Coll. vol. lxi. p. 58, pl. iv. figs. 6, 7.

Hab. Rio de Janeiro.

The type has been described by Chamberlin from Vassouras. I have seen, in the collections of the National Museum, an adult female from the neighbourhood of Rio de Janeiro.

12. *Lasiodora erythrocythara*[*], sp. n.

♀.—72 mm.; ceph. 27·5 × 25 mm.; legs 76–70–65–82 mm.; patella + tibia i. 25 mm., iv. 25 mm.

Carapace fulvous-black. Falces and legs of the same colour, with large yellowish-brown bristles; the legs with pale longitudinal bands on the upper surface. Carapace with an edge of long yellowish hairs. Abdomen velvety black, with long orange bristles.

Carapace longer than wide, longer than patella and tibia i. or iv.; fovea deep, distinctly recurved. Eyes of the anterior row very slightly procurved, the anterior edge of the medians being before the centre of the laterals, the medians much the larger, less than a diameter apart, and separated from the laterals by a space which equals their diameter; posterior medians not much smaller than the anterior medians, nearly at the same distance from them and from the posterior laterals, which are a little larger than the anterior laterals and separated from them by about half a diameter.

Stridulating-organ on coxa i. consisting of a great many simple, incrassate, but apically attenuate red bristles in several series, without basal spines, upon the suture.

Protarsal scopula i. and ii. covering the segment nearly to base; iii. covering ⅔ segment, with three spines at its base; iv. covering about ⅓—elsewhere strongly spined. All the tibiæ poorly spined.

Hab. S. Paulo.

Type in the National Museum.

13. *Lasiodora differens*, Chamberlin.

Lasiodora differens, Chamberlin, 1917, Bull. Mus. Comp. Zool Harvard Coll. vol. lxi. p. 56, pl. iv. figs. 4, 5.

Hab. Lagôa Santa (Estado de Minas Geraes).

14. *Lasiodora pleoplectra*[†], sp. n.

♀.—68 mm.; ceph. 26 × 24 mm.; legs 70–65–60–75 mm.; patella + tibia i. 25 mm., iv. 24 mm.

Integument of the carapace dark violet, with a dusky blackish clothing of short hairs and with an edge of long brown hairs; legs dusky blackish, with longitudinal, dorsal, bare, dark fulvous bands and long brown bristles. Abdomen velvety black, with long pink bristles. Sternum and coxæ dark chestnut-brown; falces greyish.

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[*] *ἐρυθρός*, red; *κιθάρα*, lute.

[†] *πλεως*, very many; *πλῆκτρον*, the little staff for striking the strings of the lyre—in allusion to the numerous bristles of the stridulating-organ.

Carapace longer than wide, slightly longer than patella and tibia i. or iv.; fovea deep, recurved.

Ocular tubercle very high, twice as wide as long. Eyes of the anterior row distinctly procurved, the anterior edge of the medians at the level of the centre of the laterals, the medians much the smaller, separated from each other by a space which equals 1½ diameter, and separated about two diameters from the laterals; posterior medians not much smaller than the anterior medians, and not very widely separated from them, closer to posterior laterals, which are much smaller than the anterior laterals and separated from them by a space which is not quite equal to the long diameter of the latter.

Stridulating-organ on coxa i. consisting of very many short plumose bristles, forming a triangular pad upon the suture, almost touching the distal end.

Sternum almost as wide as long, with conspicuous submarginal sigillæ. Protarsal scopula disposed as in *Lasiodora erythrocythara*, mihi. Tibia i. with 1 apical spine; ii. with 3 apical, 1 lower, and 1 inner; iii. with 3 apical, 1 lower, 2–2–2 inner, and 1–1–1 outer spines; iv. strongly spined.

Hab. S. Paulo.

Type in my own collection.

15. *Lasiodora dolichosterna*, sp. n.

♀.—60 mm.; ceph. 22·5 × 21 mm.; legs 70–65–61–76 mm.; patella + tibia i. 25 mm., iv. 22·5 mm.

Integument of the carapace mahogany-brown, with close clothing of short dusky hairs. Legs dark chestnut-brown, with long pale brownish bristles. Abdomen velvety black, with abundant long brick-red bristles; underside fulvous-black.

Cephalothorax longer than wide, as long as patella and tibia iv., much shorter than patella and tibia i.; fovea deep, strongly recurved. Ocular tubercle very high, almost twice as wide as long. Eyes of the anterior row very strongly procurved, the anterior edge of the medians being much behind the centre of the laterals, separated from each other by a space which surpasses their diameter, and from the laterals by about two diameters; posterior medians about as large as the anterior medians, nearly at the same distance from them and from the posterior laterals, which are much smaller than the anterior laterals and separated from them by a space which is quite equal to half the long diameter of the latter.

Sternum narrower than in some other species, much longer than wide (9·2 × 6·5 mm.), with small submarginal posterior sigillæ.

Stridulating-organ similar to the preceding species. Fang-groove with thirteen teeth on inner margin. Protarsal scopulæ and spinulation of the tibiæ as in preceding species.

Hab. S. Paulo.

Type in my own collection.

16. *Lasiodora spinipes*, Ausseror.

Lasiodora spinipes, Ausserer, 1871, Verh. zool.-bot. Ges. Wien, vol. xxi. p. 209.

Lasiodora spinipes, Simon, 1892, Hist. Nat. Ar. vol. i. p. 161.

Hab. S. Paulo (S. Paulo Museum) and Santa Catharina (National Museum).

17. *Lasiodora parahybana*, Mello-Leitão.

Lasiodora parahybana, Mello-Leitão, 1917, Broteria, Serie Zoologica, vol. xv. p. 75.

The stridulating-organ on coxa i. consists of very many plumose bristles, disposed in three transverse series, with some intermixed clavate bristles.

Hab. Campina Grande (Parahyba do Norte).

18. *Lasiodora itabunæ**, sp. n.

♀.—75 mm.; ceph. 29 × 27·5 mm.; legs 83–75–75–89 mm.; patella + tibia i. 29 mm., iv. 27 mm.

Integument of carapace blackish violet. A close black clothing of short hairs covering the body and limbs; the legs with long brownish setæ and bare dorsal longitudinal bands of a reddish-violet hue. Abdomen with no abundant long fulvous bristles. Coxæ of pedipalps and margins of fang-groove with vinous-reddish bristles.

Cephalothorax longer than wide, as long as patella and tibia i. and longer than patella and tibia iv.; fovea deep, wide, slightly recurved. Ocular tubercle very high, nearly as long as wide. Eyes of anterior rows procurved, the anterior edge of the medians being much slighter before the centre of the laterals, nearly evenly spaced and a little unequal in size, the medians the smaller, separated from each other by a space equal to their diameter; posterior medians much smaller than the anterior medians, close to the posterior laterals, which are distinctly smaller than the anterior laterals and separated from them by a space which is quite equal to the long diameter of the latter.

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* Named after its habitat—Itabuna, a little town in Bahia State.

Stridulating-organ on coxa i. consisting of seven simple incrassate but apically attenuate plumose bristles, disposed in a single series and separated from the suture by a bare band.

Protarsal scopula of i. and ii. covering the segment nearly to base, iii. covering ½, and iv. only the tip.

Fang-groove with eleven teeth on inner margin.

Hab. Itabuna (Bahia).

Coll. E. Garbe. Type in the S. Paulo Museum.

There are twelve other large spiders described under the genus *Lasiodora*, and belonging respectively to:—

GRAMMOSTOLA, Simon.

Lasiodora rosea, C. Koch, = *Grammostola spatulata*, F. Cambridge.

HOMŒOMMA, Ausserer.

Lasiodora versicolor, C. Koch, = *Homœomma stradlingi*, O. Cambridge.

PAMPHOBETEUS, Pocock.

Lasiodora augusti, Simon, = *Pamphobeteus augusti* (Simon), Pocock.

—— *benedeni*, Bertkau, = *Pamphobeteus benedeni* (Bertkau), Mello-Leitão.

—— *ferox*, Ausserer, = *Pamphobeteus ferox* (Ausserer), Pocock.

—— *fortis*, Ausserer, = *Pamphobeteus fortis* (Ausserer), Pocock.

—— *nigricolor*, Ausserer, = *Pamphobeteus nigricolor* (Ausserer), Pocock.

—— *vespertina*, Simon, = *Pamphobeteus vespertinus* (Simon), Pocock.

MEGAPHOBEMA, Pocock.

Lasiodora robusta, Ausserer, = *Megaphobema robusta* (Auss.), Pocock.

XENESTHIS, Simon.

Lasiodora immanis, Ausserer, = *Xenesthis immanis* (Auss.), Pocock.

PHORMICTOPUS, Pocock.

Lasiodora cauta, Ausserer, = *Phormictopus cautus* (Auss Pocock.

XXXI.—*Notes on some Japanese Cephalopods.—A Review of Sasaki's 'Albatross' Report*[*]. By S. STILLMAN BERRY, Redlands, California.

THE important collection of Cephalopods obtained by the 'Albatross' in the North-western Pacific in 1906, originally in the hands of Prof. S. Watasé for study, was by him turned over to Prof. Sasaki, from whose pen now comes the present welcome paper.

Although the unfortunate brevity of many sections would not ordinarily so indicate, this evidently constitutes the long-awaited final report on the collection. The author is understood to be engaged upon a monographic survey of the cephalopods of Japan, in course of which it is but fair to suppose that he intends to elucidate the characters of the species concerned in much greater detail. Be that as it may, the forty and odd pages of the 'Albatross' report record a collection of sixty species (an astounding number of these animals for so narrowly delimited a region, and one which could probably be duplicated by similar expenditure of time and energy nowhere else in the world, unless in some of the little-known areas of the South Pacific), apportionable among twenty-nine genera. Of these no less than eighteen species, two subspecies or varieties, and two genera are described as new. *Watasella*, the first of the new genera, is based upon an extraordinary cirroteuthid, in which a "tubular pouch," enclosing a curious filamentous organ, "exists between the first and second arms on either side, running radially through the umbrella, and opening externally on the umbrella edge." Although the significance of such an arrangement can hardly be guessed at from the scanty information given, it seems to the reviewer that the creation of a new family principally on this basis, as Sasaki seems to have done, is possibly premature. The conservative and more fundamental features of the Cirroteuthoidea are so much more impressive than their divergencies that there is certainly ground for the feeling that their relationships are better expressed by the inclusion of all within the confines of a single family than by the separation into two or more families on the ground of purely adaptive characters, such as the presence or absence of an odontophore, the width of the pallial aperture, the compression of the body, and so on, as has been attempted in various ways by Thiele, Grimpe, and other recent German writers. Further investigation of the filamentiferous pouches of *Watasella*, its skeletal features, and buccal organs, will be awaited with interest. There seems indeed no vanguard to the procession of astonishing novelties being continuously brought to light from the Japanese fauna.

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[*] "Report on Cephalopods collected during 1906 by the United States Bureau of Fisheries steamer 'Albatross' in the North-western Pacific." By Madoka Sasaki. (Proceedings United States National Museum, vol. 57, pp. 163-203, pls. 23-26, 1920.)

The second new genus, *Gonatopsis*, is likewise somewhat of a puzzle. Its most extraordinary peculiarity, and that which has suggested the name of its type-species, *octopedatus*, is dismissed with a curt two words, "Tentacles absent." But the same condition has been described so frequently in the history of cephalopod taxonomy that one may be pardoned a little healthy scepticism until more conclusive evidence can be brought forward to show that this loss is not the result of accident or otherwise a secondary or ontogenetic circumstance.

Chunella is proposed as a new generic name for *Bolitæna diaphana* (Hoyle), Chun, on the suggested rather than proven ground that the typical *Bolitæna* of Steenstrup is related to *Alloposus* rather than to *Eledonella*, as maintained by Chun. This is an interesting view, and should be inquired into farther by someone in a position satisfactorily to settle the point raised, but the argument advanced requires much elaboration to be altogether convincing.

A great preponderance of the new forms described (12 out of 20) are members of the genus *Polypus*. It is impossible at present to give any rational discussion of the probable relationships of these, but attention should be called to the fact that two of the new names proposed are unfortunately preempted for use elsewhere. As Prof. Sasaki has most courteously expressed a wish that the present reviewer rechristen them, the name *Polypus hokkaidensis* is here proposed for *Polypus glaber*, Sasaki, 1920, not *P. glaber*, "Rüppell," Wülker, 1920 (prior publication), and the name *Polypus madokai* * for *P. pustulosus*, Sasaki, 1920, not *Octopus pustulosus*, "Peron," Blainville, 1826.

An interesting feature of the paper is the discovery in Japanese waters of the genus *Scæurgus*, hitherto known only from the Hawaiian Islands and the Mediterranean. In view of the several discrepancies noted by Sasaki, its specific identity with the Hawaiian form is probably not certain.

It is worth noting that by all odds the most abundant species in the collection, represented by about 100 specimens, was *Rossia pacifica*.

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* Named in honour of Prof. Sasaki in recognition of his work as a student of Japanese Cephalopoda, as well as in some degree to acknowledge the recent receipt of several signal courtesies from his hands.

XXXII.—*Further Notes on various South-African Species of* Melyris, *Fabr.* [*Coleoptera*]. By G. C. CHAMPION.

SINCE the publication of my "Notes on the African and Asiatic Species of *Melyris*, Fabr." [Ann. & Mag. Nat. Hist. (9) iv. (Oct. and Nov. 1919)], I have been able, through the kindness of Dr. L. Péringuey and Dr. Y. Sjöstedt respectively, to see the type of *M. limbata*, Péring., and types or co-types of the four species named or described by Boheman. The result of this examination shows that my interpretation of these authors' descriptions was incorrect in several cases, and the following emendations to the synonymy are required:—

M. rufomarginata (Dej. Cat.), Champ. (No. 4, p. 164) = *M. limbata*, Péringuey, whose name will have to be adopted, that of Dejean being a *nomen nudum*.

M. pubescens, Oliv. (No. 5, p. 164).—This is the species named and described by Boheman as *M. lineata*, F. Whether Boheman had correctly identified the Fabrician insect it is impossible to say without comparing his Caffrarian specimens with the type. In any case, Olivier's name (1790) has two years' priority.

M. lineata, F. (No. 6, p. 165) = *M. sulcicollis*, Boh. Several ♀ ♀ were doubtfully referred by me to *M. lineata*, F. I have since seen a ♀ from Reenen, Natal (*Mus. Durban*), and a ♂ from Grahamstown (*coll. Pic*) of the same species; this latter has ventral segment 5 deeply arcuate-emarginate at the apex and arcuately excavate above, and 6 lobed on each side at the tip.

M. natalensis, Boh. (No. 12, p. 170).—This species was wrongly identified from the description. The type, ♂, except in colour, is very like *M. violacea*, Champ. (No. 10), differing from it in having the prothorax more rounded at the side and its surface strongly tuberculate between the reticulations. The ♂ terminal ventral segments are similarly formed in these two insects.

M. sulcicollis, Boh. (No. 13, p. 170) = *M. lineata* (F.), Champ. Fortunately the Dejean Catalogue name *M. interstitialis* is available for the Common Transvaal and Natal insect incorrectly referred by me, with a var. *varipes*, to *M. sulcicollis*. It is recognizable by the closely, finely punctured elytral interstices. My so-called *M. natalensis*, Boh., is connected with it by intermediate forms, and it is perhaps best treated as an extreme variety of *M. interstitialis*. A fresh description is not required.

M. rufiventris, Boh. (No. 14, p. 171). The type, ♂, agrees with the specimens thus named in my "Notes."

The revised synonymy will stand as follows:—

4. *M. limbata*, Péring. (1885).
rufomarginata (Dej. Cat.), Champ. (1919).

5. *M. pubescens*, Oliv. (1790).
lineata, Fabr. (1792) (nec Champ., 1919).

6. *M. sulcicollis*, Boh. (1851).
lineata (F.), Champ. (1919).

12. *M. natalensis*, Boh. (nec Champ., 1919).

13. *M. interstitialis* (Dej. Cat.), Champ. (1919).
sulcicollis and var. *varipes*, Champ. (nec Boh.).
Var. *natalensis*, Champ. (nec Boh.).

XXXIII.—*New* Cryptotis, Thomasomys, *and* Oryzomys *from Colombia*. By OLDFIELD THOMAS.

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BY the kindness of Frère Nicéforo Maria of the Colegio de San José, Medellin, the British Museum has been enabled to acquire by exchange a number of small mammals from the neighbourhood of that town. Among them there occur examples of the three following new species:—

Cryptotis medellinius, sp. n.

Most nearly allied to *C. meridensis*; larger than *C. thomasi* and *equatoris*.

Size about as in *meridensis*, the skull slightly shorter, but more robust. Proportions about as in that animal, though the tail of the single specimen is a little shorter. Fur as usual, hair of back about 4·8 mm. in length. General colour dark mouse-grey, less brown than in the other three S. American species. Ends of digits, both fore and hind, whitish. Tail with a few whitish hairs terminally, otherwise dark brown.

Skull rather shorter and more robust than in *meridensis*, the muzzle shorter and the interorbital region broader. As an indication of the shortening of the muzzle, the distance from the back of i^1 to the front of p^4 is only 2·0 mm. as compared with 2·6 in the type of *meridensis*. Brain-case more inflated upwards, a marked angle at the junction of brain-case and face.

Anterior upper incisor shorter and more proclivous; large unicuspids more vertical, less oblique, in order to crowd into the shorter space available.

Dimensions of the type, taken on the skin:—

Head and body 92 mm.; tail 30; hind foot 15.

Skull: condylo-basal length 21·7; condylo-incisive length 22·7; interorbital breadth 5·3; breadth across brain-case 11; length from nasal notch to foramen above olfactory fossa 9·2; upper tooth-series 10; front of p^4 to back of m^3 5·8.

Hab. Medellin region of Colombia: type from San Pedro, 30 km. north of Medellin.

Type. Adult male. B.M. no. 21. 7. 1. 9. Original number 10. Collected December 1919 by Frère Nicéforo Maria.

The Panama *Cryptotis* described by Mr. Goldman as *C. merus* is considerably smaller than *C. medellinius*.

Thomasomys nicefori, sp. n.

Near *T. aureus*, but smaller and with smaller teeth.

General appearance very much as in *T. aureus*, though the head and fore back are rather less richly fulvous, but the colours are essentially the same, with the same buffy or ochraceous suffusion above, becoming richer on the rump, and with the same buffy washing of the belly. Feet comparatively light and delicate, buffy whitish, with darker patches on wrists and metacarpals, ankles and metatarsals. Tail well haired, uniformly brown, not so long as in the allied species.

Skull smaller throughout than in *T. aureus*, therefore much smaller than in *T. princeps* of Bogota. Muzzle slender; nasals narrow. Interorbital region comparatively broad, less sharply defined and ridged than in the other species. Palatal foramina as usual larger and open. Molars small and delicate, both shorter and narrower than in the other members of the group.

Dimensions of the type, measured on the skin:—

Head and body 150 mm.; tail 187; hind foot (wet) 32; ear 19.

Skull: greatest length 36·5; condylo-incisive length 33·8; zygomatic breadth 19; nasals 13·2 × 4; interorbital breadth

5·3; palatilar length 15·2; palatal foramina 8·2; upper molar series 6; breadth of m^1 1·5.

Hab. Medellin. Type from San Pedro, north of the town.

Type. Adult male. B.M. no. 21. 7. 1. 20. Original number 9. Collected December 1919. One specimen.

This fine rat is a member of the *T. aureus* group, of which I have before me examples of all the described species. Its skull and, especially, its molars are so much smaller than the corresponding parts in *aureus* that it clearly needs a new name. The *T. princeps* of Bogotá is larger than *aureus*, while Allen's *T. popayanus* is of about the same size as the latter, and is perhaps rather doubtfully separable from it.

I have much pleasure in naming this handsome animal in honour of the naturalist to whom we owe its discovery.

Oryzomys intectus, sp. n.

A small species with short tail, somewhat like *O. balneator*, but with larger molars.

Size rather larger than in *balneator*. Fur soft and fine, hairs of back about 7 mm. in length. General colour above uniform dark mouse-grey, very like that of *Mus musculus*, the hairs finely ticked with drabby. Sides more drabby. Under surface slaty grey, the ends of the hairs dull whitish. Face more blackish, a blackish area round the eyes, below and behind which the light colour of the throat extends rather high up towards the ear, forming a light whisker-mark. Hands and feet whitish above. Tail unusually short, apparently not as long as the head and body, very finely haired, almost naked, brown above, dull whitish below.

Skull peculiarly short, broad, and rounded, with broad interorbital region. Indeed, it is almost precisely like that of a *Melanomys*, with the important exception that there is no trace of the supraorbital beading so conspicuous in that group. Brain-case similarly low, smooth, and without ridges. Palatal foramina short, about the length of the tooth-row. Molars stout and heavy, large for the size of the animal, their structure more like that in *Melanomys* than in the smaller species of *Oryzomys*, but many of the larger species of *Oryzomys* also have quite similar molars.

Dimensions of the type, measured on the skin:—

Head and body 100 mm.; tail 91; hind foot (wet) 22.

Skull: greatest length 26·2; condylo-incisive length 23·5; zygomatic breadth 14·2; nasals 10·3; interorbital breadth 5; breadth of brain-case 12·2; palatilar length 11·4; palatal foramina 4·2 (4·6 in an older specimen); upper molar series 4·2.

Hab. Medellin. Type from Santa Elena.

Type. Adult male. B.M. no. 21. 7. 1. 17. Original number 29. Collected January 1920. Three specimens.

This is a remarkably distinct species, whose systematic position is not at present easy to determine. Its peculiarly broad low skull distinguishes it from any *Oryzomys* known to me, while the entire absence of supraorbital ridges separates it from *Melanomys*, to which its short tail and the general shape of its skull perhaps indicate some affinity. Many *Oryzomys*, however, have no supraorbital ridges, and I therefore provisionally place it in that genus.

XXXIV.—*New* Pseudochirus *and* Phascogale *from N. W. New Guinea.* By OLDFIELD THOMAS.

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A FURTHER small consignment of Mammals has been received from the Pratt Brothers, who have been collecting in the Weyland Mountains, N.W. New Guinea (approximately 135° 40′ E., 3° 40′ S.), a region hitherto almost untouched.

The collection includes examples representing the two following new mammals:—

Pseudochirus caroli, sp. n.

A large member of the *canescens-forbesi* group; most nearly allied to *Ps. larvatus*; a white tip to the tail.

Size larger than in any of the species allied to *canescens*, more as in some of the members of the *albertisi* group. General colour above more "buffy-brown" or rather darker; an indistinct darker median dorsal line from withers to rump. Underside white, the hairs creamy white to their bases. Face greyish brown, not rufous, without defined median dark line; chin blackish. Back of ears and a patch in front of them black; a prominent white patch below and behind them. Fore limbs with the whole of their outer as well as their lower side white, in continuation with the white of the belly, the white extending on to the outer halves of the metacarpals; warm brown of body-colour extending in a rather narrow line down the front of the forearm to the wrist; proximal part of digits blackish, lightening terminally. Behind the outer sides of the legs and the whole of the feet are white. Tail well furred proximally, brown for its basal three inches, then darkening nearly to black for its next three inches, and then changing abruptly to white, the white corresponding in length to the part which is naked below.

Skull larger than in *larvatus*, but of similar form. Nasals widely expanded behind. Interorbital region narrow, with the usual parallel rounded ridges. Posterior part of bullæ unusually swollen, projecting nearly as far backward as the condyles do.

Teeth with the usual well-marked diastemata characteristic of the group. Molariform teeth narrow.

Dimensions of the type:—

Head and body 300 mm.; tail 370, its white terminal part 170; hind foot 45; ear 22.

Skull: condylo-basal length 61·7; zygomatic breadth 35; nasals, length 18, least breadth 4·3, greatest breadth 10·3; intertemporal breadth 7; palatal length 33; length of three anterior molariform teeth 10·6.

Hab. Weyland Mountains, N.W. New Guinea. Type from Mt. Kunupi, Menoo Valley. Alt. 6000′.

Type. Adult male. B.M. no. 21. 8. 1. 15. Original number 49. Collected 16th November, 1920, by Messrs. Pratt Bros. One specimen.

"Came to the bright light used for attracting moths."—C. B. P.

This most distinct species presents an interesting mixture of the characters of the different "subgenera" of *Pseudochirus*. Clearly most nearly related to *Pseudochirulus*, it is as large as the smaller species of *Pseudochirops*; it has the white-ended tail said to be confined to *Pseudochirus*, while its brown instead of fulvous face is like *Pseudochirops* and not *Pseudochirulus*. Its white under surface and the white outer sides of its forearms are peculiar to itself.

I have named it in honour of Mr. Charles B. Pratt, who has taken great interest in the collecting of mammals in the little-known parts of New Guinea where he and his brothers have been working.

Phascogale lorentzi venusta, subsp. n.

Very like *P. lorentzi*, as described from normal non-melanistic specimens in 1912 [*], the original *lorentzi* having been based on a melanoid example. General colour less rufous owing to the tips of the underfur being more buffy than rufous, but otherwise the mixture of buffy and black ticked with white is essentially similar. Under surface, however, very much less rufous, the rich rufous wash on the chest and middle area of belly replaced by dull pale cinnamon, while that on lower aspect of the forearms and legs, very prominent in *lorentzi*, is quite absent, these parts being simply dull greyish brown. Head mixed buffy and black. Ears almost naked internally, the metentote with a few ochraceous hairs; externally they are finely clothed with whitish hairs, which extend on to the sides of the neck and form a prominent whitish patch. Limbs not very different from the body, the forearms above more cinnamon; upper surface of hands and feet like body on the metapodials, the digits dark brown.

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[*] Ann. & Mag. Nat. Hist. (8) ix. p. 91.

Skull very like that of *lorentzi*, but the bullæ are less swollen. Incisors slightly smaller, so that the row of four measures about 4·2 instead of 5 mm.

Dimensions of the type:—

Head and body 187 mm.; tail 188; hind foot 39; ear 23.

Skull: condylo-basal length 46·5; zygomatic breadth 36; nasals 19·4 × 6; interorbital breadth 9·5; palatal length 25·5; maxillary tooth-row 18; length of three anterior molariform teeth 7·9.

Another much damaged skull has a condylo-basal length of 53·5 mm.

Hab. Weyland Mountains, Dutch New Guinea. Type from Mt. Kunupi. Alt. 6000′.

Type. Adult male. B.M. no. 21. 8. 1. 11. Original number 51. Collected 20th December, 1920. Four specimens.

Assuming the identity of the Goliath Mountain specimens described in 1911 with the melanistic *P. lorentzi*, the present handsome animal may be readily distinguished by the white patches behind its ears, and by the brown instead of rufous lower aspect of the forearms and thighs.

XXXV.—*Descriptions and Records of Bees.*—XCI.

By T. D. A. COCKERELL, University of Colorado.

Mesonychium dugesi, Cockerell.

Garden Cañon, Huachuca Mts., Arizona (*W. H. Mann*) U.S. Nat. Museum.

Genus new to the United States.

Nomia (*Crocisaspidia*) *muscatensis*, Cockerell.

Aden (*Muir*). Cambridge University Museum.

Nomia aurifrons, Smith.

On comparing Smith's type ♀ with the type of my *N. andrenina*, I find them identical.

Nomia exagens (Walker).

Halictus timidus, Smith, from Ceylon, is the same, as Meade-Waldo had determined from the types in the British Museum, and I can confirm.

Nomia zebrata, Cameron.

The types of *N. zebrata*, Cameron, and *N. frederici*, Cameron, in the Rothney collection at Oxford, represent the same species.

Nomia pulchriventris (Cameron).

Bingham says of *Halictus pulchriventris*, Cameron: "type (♂) in coll. Rothney." I found it there, and it is a *Nomia* with claviform abdomen; hind basitarsi yellowish white.

I also found one, marked type, in the British Museum. Anterior wing 7 mm. long, dusky, darker at apex. Hind legs simple.

Sphecodes cameronii (Bingham).

Halictus cameronii, Bingham, 1897 (*decorus*, Cameron), is a small *Sphecodes*, as shown by the type in the Rothney collection.

♀.—No caudal rima; first three abdominal segments bright chestnut; face very broad; mesothorax and scutellum shining.

India.

Sphecodes iridescens, n. n.

Sphecodes cameroni, Schulz, 1906 (*iridipennis*, Cameron). S. Africa.

Halictus kalutaræ, Cockerell.

Meade-Waldo (1916) found that *Nomia vinota*, Walker, was an *Halictus*, and placed my *kalutaræ* as a synonym. On comparing the types in the British Museum I find that they are distinct. In *kalutaræ* the sharp rugæ on anterior part of mesothorax on each side of middle line bend backward, to meet the opposite ones and form a series of V's; this is not the case with *vinctus*. *H. kalutaræ* also has a larger head, elevated posteriorly, and sides of vertex shining (dull in *vinctus*). They are, however, allied.

Halictus matheranensis, Cameron, 1907.

H. emergendus, Cameron, 1908, is a little larger, but is the same species.

Postscutellum densely covered with pale ochreous-tinted tomentum.

India.

Halictus inoa (Cameron).

Andrena inoa, Cameron, 1904 (type, ♂, in British Museum), belongs to *Halictus*.

Face broad, with subparallel eyes; stigma and nervures bright ferruginous; middle of scutellum with moss-like bright ferruginous hair; abdominal segments with basal hair-bands.

Himalayas.

Halictus pseudopectoralis, Cockerell.

Halictus notaticollis, Friese, 1916, from Costa Rica, is a synonym. The U.S. National Museum has specimens of *notaticollis* from Friese.

Halictus oppositus (Smith).

The type (♀) of Smith's *Nomia opposita* from China, in the British Museum, is a species of *Halictus*.

Mesothorax and scutellum entirely dull. Wings brownish, first r. n. meeting second t.-c., third s.m. subquadrate, very broad above. Hind spur dentate. Entire creamy-white bands at bases of abdominal segments 2 to 4.

Halictus sepositus, sp. n.

♂ (type).—Length about 12 mm.

Slender, black; clypeus produced, convex, rugoso-punctate, glistening, entirely black except for a pair of very obscure reddish marks near apex; in lateral profile of head the clypeus is entirely out of line with eyes; malar space distinct. Head broad, oval, facial quadrangle much higher than broad, orbits nearly parallel; front dull and granular; antennæ long, joints 4 to 9 clear ferruginous beneath; head and thorax with long, thin, pale fulvous hair; mesothorax and scutellum closely and finely punctured, somewhat glistening; area of metathorax finely rugose, posterior truncation not defined; tegulæ dark rufous, with a piceous spot. Wings faintly reddish, stigma bright ferruginous, nervures fuscous; third s.m. long, fully as broad on marginal as second; second s.m. about square, receiving r. n. beyond middle; outer r. n. and t.-c. strong. Legs black, with knees, tibiæ, and tarsi ferruginous; hind tibiæ with a very faint dusky shade posteriorly. Abdomen glistening, extremely finely punctured, hind margins of segments with dull white hair-bands.

♀.—About 12 mm. long.

Robust; hair-bands confined to sides of abdominal segments; posterior truncation of metathorax nowhere sharply defined, longitudinal striæ on each side of its median sulcus; area of metathorax with coarse rugose hide-like sculpture; clypeus shining, with large punctures, flagellum very obscurely reddish beneath; hind spur with five erect saw-like teeth; third s.m. not quite so broad on marginal as second; surface of abdomen thinly hairy, first segment shining. Wings reddened. Hind tibiæ and tarsi densely covered with fulvous hair.

Madeira (*T. V. Wollaston*). Oxford Museum.

This stands in the Wollaston collection as *H. quadristrigatus*, Latr. (which is *quadricinctus*, Fabr.), and is closely allied to that variable species, yet evidently distinct, especially by the dark clypeus in the male. It was examined years ago by E. Saunders and Vachal, and they agreed that it was distinct from *quadristrigatus*. Another female stands in the collection as *H. zebrus*, Walck.; it is not so large, the mesothorax is more finely sculptured, but the hind legs have the same fulvous hair and the same spurs. After careful comparisons I concluded that all the specimens represented a single species.

Neocorynura pubescens (Friese).

Halictus pubescens, Friese, from Costa Rica, is represented in the U.S. National Museum by material from Friese. It is identical with a *Neocorynura* from Costa Rica named years ago by Vachal, but, so far as I can find, not published.

Thorax emerald-green, the mesothorax with short moss-like red hair*; hind spur of ♀ with very few long stout spines; apex of flagellum bright red; eyes deeply emarginate; area of metathorax with very fine radiating striæ.

Agapostemon virescens (Fabricius).

The type is in the Banks collection at the British Museum, and is our common American species. The name dates from 1775, *viridulus* (Fabricius) from 1793. Moses Harris, in his 'Exposition of English Insects' (1782), figures and describes a male as *Apis vitreus*. The names of Harris have generally been ignored, but they are as valid as those of Drury, after whose work that of Harris was modelled. The binomials appear in the index.

Prosopis maderensis, sp. n.

♀.—Length about 7 mm.

Black, with a broad, elongate, pale yellow mark on each side of face, its ends rounded, the upper end level with antennæ, the lower (more mesad) above middle of clypeus; clypeus elongate, dull, finely aciculate; mandibles and antennæ black, scape not swollen; thorax with very scanty white hair; mesothorax dull, very minutely and densely punctured; area of metathorax with irregular, rather weak, raised reticulation on basal middle, otherwise finely rugose; tegulæ black. Wings slightly brownish, nervures and stigma piceous; b. n. falling a little short of t.-m.; second s.m. broad, receiving first r. n. near its base. Abdomen shining, extremely finely punctured, without hair-patches.

Madeira (*T. V. Wollaston*). Oxford Museum.

It was labelled "n. sp. allied to *signata*." It is easily known from *signata* by the delicate sculpture of the abdomen.

Allodape mixta (Smith).

The type of *Prosopis leucotarsis*, Cameron, in the Rothney collection, is an *Allodape*. I assume that Bingham is correct in referring it to the older name *mixta*, Smith.

Length about 5 mm.

Clypeus creamy white, with very small lateral face-marks next to the lateral notches in clypeal colour: tongue long, linear; tarsi creamy white, front ones reddened; nervures pale, stigma dark-margined.

Bombus rubriventris, Lepeletier.

At Oxford, in material belonging to the Hope collection, which had passed through the hands of Lepeletier, I found a *B. rubriventris*, probably the type. It is labelled "St. Domingue." It is a remarkable *Bombus*, black, with abdomen beyond first segment covered with very bright blood-red hair as far as end of fourth segment (red hair overlapping fifth), but black on fifth segment. Malar space moderate (rather shorter than in *brasiliensis*); ocelli small; top of head and mesothorax in front with black hair, but behind the broad band on front of mesothorax, abruptly, the short hair is dull grey; long grey hairs at sides of scutellum; pleura with pale greyish hair; anterior wing about 18 mm., dark reddish fuliginous (not so dark as in *brasiliensis*); hind tibiæ dark red, with black hair.

Euglossa analis, Westwood.

I found a specimen, evidently the type, at Oxford. Clypeus with the usual three keels; labrum &c. creamy white; dark purple-blue, apex of abdomen (beyond fourth segment) broadly and abruptly emerald-green.

Length 10 mm. or a little over.

Friese gives this as a doubtful synonym of *E. cordata* (L.), but it is evidently the prior name for *E. azurea*, Ducke.

Megachile bicolor (Fabricius).

In 1919 I published *Megachile fletcheri* from India, believing it to be closely allied to but separable from *bicolor*. Mr. T. B. Fletcher wrote that he considered it to be identical with *bicolor*, and sent for comparison both sexes from Coimbatore (*Fletcher*), Pusa, Behar (*G. D. O.*), and Chapra, Bengal (*Mackenzie*). I took these to the British Museum, and, on comparing them with the series there, could only conclude that all were one species—*M. bicolor*.

Megachile semipleta, sp. n.

♂.—Length about 10 mm.

Black, with small joints of tarsi reddened, the last bright ferruginous; antennæ entirely black; head ordinary, face and cheeks with long creamy-white hair, vertex with dark chocolate-brown hair; mesothorax glistening, closely punctured, with brownish-black hair, but other parts of thorax with creamy-white hair; anterior tarsi simple and anterior coxæ without spines; claws bifid. Abdomen glistening, short and broad, first two segments with pale hair; segments 3 to 5 with bands of pale hair, but in front of these the hair is brown-black; appressed pale hair at base of fifth; sixth segment retracted, with thin, erect, inconspicuous hair, dullish, with minute sculpture, and with a strong depression above the keel, which is shallowly emarginate but not dentate.

Madeira (*Wollaston*). Oxford University Museum.

As E. Saunders remarked, it seems to be nearest to *M. versicolor*, Smith.

Megachile xylocopoides, Smith.

Buena Vista, Florida (*Chas. Mosier*). U.S. Nat. Museum.

Megachile hæmatopus, n. n.

Lithurgus rufipes, Smith, Cat. Hym. Brit. Mus. i. (1853) p. 145. Not *Megachile rufipes* (Fabricius).

I examined the type, from Port Natal, in the British Museum.

Mandibles mainly red; clypeus strongly transversely depressed above margin; tegulæ bright ferruginous; white pubescence in scutello-mesothoracic suture, and spots behind tegulæ; legs bright red, tarsi darkened; second abdominal segment metallic green dorsally; ventral scopa white, black on last segment and part of penultimate; abdomen short and broad; marginal cell and apex of wing fuliginous. ♀.

Lithurgus lissopoda (Cameron).

Megachile lissopoda, Cameron, 1908, is a *Lithurgus*.

Tubercle on face hardly indicated; a robust species, with very robust hind femora; hind basitarsi broad at end, the broad part exposed and shining.

Length about 11 mm.

British Museum.

Lithurgus nigricans (Cameron).

Megachile nigricans, Cameron, 1898, from Ceylon, is a male *Lithurgus*. I examined the type in Rothney collection at Oxford.

Length 11 mm.

Scutellum with much black hair; tongue and labial palpi extremely long, the tongue would reach tip of abdomen, labial palpi about 6 mm.; a polished punctureless space on each side of ocelli: flagellum remarkably short; hind tibiæ very thick; no pulvilli; b. n. falling far short of t.-m.

Lithurgus taprobanæ (Cameron).

Megachile taprobanæ, Cameron, 1904, from Ceylon, is represented by the ♀ type in the British Museum. It is a *Lithurgus*.

Silky white hair on clypeus and sides of face; supraclypeal area with transverse gibbous lower margin; abdomen smooth and shining, with the white hair-bands very narrow, last segment with fuscous hair.

The males placed with it, from Kandy (*R. Turner*), are *Megachile*.

Heriades spiniscutis (Cameron).

Megachile spiniscutis, Cameron (male type in British Museum), is a *Heriades* with large curved spines at sides of thorax posteriorly; pulvilli distinct; eyes slate-colour or dark grey (not green); b. n. nearly reaching t.-m.

S. Africa.

Standing next to this in the British Museum is *Megachile suavida*, Cameron, ♀. It has pulvilli, and is a *Heriades*. Ventral scopa yellowish white; b. n. meeting t.-m.; eyes lilac.

The name *M. suavida* was published by Cameron in 1908, based on a male from India.

Osmia leptodonta (Cameron).

Megachile leptodonta, Cameron, 1908, in British Museum, is an *Osmia*.

Flagellum bright red beneath; mandibles peculiar, with dense white hair at base, middle pale red, and apical margin and teeth abruptly dark; pulvilli present; abdomen more or less red along the margins before the entire white hair-bands.

Heriades pulchripes (Cameron).

Megachile pulchripes, Cameron, 1897, from India, is a *Heriades*, as shown by the ♀ type in the Rothney collection at Oxford.

Length about 6·5 mm.

Pulvilli present; basin of first abdominal segment with sharp edge; middle and hind femora and tibiæ clear chestnut-red; facial quadrangle much longer than broad, with a broad band of white pubescence at each side; stigma ferruginous.

Meade-Waldo has placed *M. elfroma* and *saphira*, Cameron, with this species in the British Museum. These are males, with abdomen curled under apically, and shining testaceous borders to the closely punctate segments; the b. n. fails to reach t.-m. The tibiæ and tarsi are mainly red in *saphira*, darker in *elfroma*, but they are certainly one species. I could not see any pulvilli in *elfroma*.

Gronoceras denticulata (Reiche).

Friese's description of the male *Megachile denticulata* in 'Das Tierreich' is quite wrong. It is a *Gronoceras*, and has very broad pale anterior tarsi. The last ventral segment has a stout truncate spine, and apex has two long curved spines and a brush of black hair. I examined specimens in the British Museum which agree with the original description and figure.

Ceratina dimidiata, Friese, 1910.

Specimens in the U.S. National Museum, received from Friese, show that this is identical with *C. azteca*, Cresson, as determined (I believe correctly) by Crawford.

Colletes dudgeonii, Bingham, 1897.

C. dentata, Cameron, 1898, is the same species. The male has a short malar space.

Colletes reticulatus (Cameron).

Andrena reticulata, Cam., and *A. saevissima*, Cam. (misprinted *sacrissima* in Bingham's work), are females of one species of *Colletes*. The malar space is about twice as broad as long; upper part of supraclypeal area highly polished. Specimens of both supposed species are in the Rothney collection at Oxford and in the British Museum.

Colletes phædra (Cameron).

Andrena phædra, Cam., is a male *Colletes*, with darker tegulæ than *reticulatus*. I decided that it was the male of *reticulatus*, but found a male placed with *saevissima* in the

British Museum a good deal larger than *phædra*, with the malar space a little broader than long (in *phædra* it is more shining and fully as long as broad). The *phædra* abdomen is more shining, with finer punctures. They agree in venation. Assuming this *saevissima* male to belong with *reticulatus*, it seems probable that *phædra* is distinct.

Andrena sodalis, Cam., published at the same time, is evidently the insect standing in the Rothney collection under a slightly modified name, *sodalis* having been earlier used by Smith. It is a *Colletes*, with the dorsal hair of thorax bright fox-red, and the first abdominal segment perhaps more distinctly punctured than in *phædra*. I believe it is conspecific with *phædra*.

Anthophora whiteheadi, Cockerell.

Yalauer Archipelago, Celebes (*Hickson*). Cambridge Museum.

A ♀ in poor condition, having been in liquid, but apparently not distinct from this Philippine species.

Chalicodoma sicula, Rossi.

El Arabah, Abydos, Upper Egypt (*Baron A. von Hugel*). Cambridge University Museum.

Lithurgus echinocacti, Cockerell.

Sabino Basin, Sta. Catalina Mts., Arizona, Aug. 30 (*C. H. T. Townsend*).

Pseudopanurgus fraterculus, Cockerell.

Sabino Basin, Sta. Catalina Mts., Arizona, Sept. 3 and 28 (*Townsend*).

Nomioides facilis (Smith).

Halictus facilis, Smith, from Malta. *Nomioides fallax*, Handlirsch.

Thygatina fumida, Cockerell.

The following note is attached to the specimens in the British Museum:—" I found these tunnelling in a bank and storing their nest with pollen. The tunnel went into the bank about 8 to 10 inches. Kandy, Ceylon, Jan. 1908. O. S. W."

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XXXVI.—*Records and Descriptions of South African Grasshoppers of the Groups* Arcypteræ *and* Scyllinæ. By B. P. Uvarov, F.E.S., Assistant Entomologist, Imperial Bureau of Entomology.

The present paper is the first of a series based on the collection of South African Acridians recently sent to the Imperial Bureau of Entomology for identification by the Division of Entomology, Pretoria, and made chiefly by Messrs. Ch. P. Lounsbury and J. C. Faure. In working out this collection it has been found practicable to include also the South African material of the British Museum Collection, where many unnamed accessions have recently accumulated. The number of new species and genera amongst the South-African grasshoppers has proved to be astonishingly large, and further collecting, especially of the smaller forms, must lead to the discovery of still more novelties; even amongst the large-sized ones new forms are not infrequent, which indicates that our knowledge of the South African Orthopterous fauna is still very inadequate.

The Group *Arcypteræ* *.

There is only one African genus of this group—*Pseudoarcyptera*, Bol., with one species in it, *P. carvalhoi*, Bol., but in the collection before me now there are two species which undoubtedly belong to the genus *Aulacoboturus*, Bol., known hitherto from India only; both these species are new and described below.

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* I. Bolivar, "Les Truxalinos del antiguo Mundo," Trab. Mus. Nac. Madrid, ser. Zool., Núm. 20, 1914, pp. 44 & 54.

1. *Pseudoarcyptera carvalhoi*, Bol.

The species was described by I. Bolivar from Lourenço Marquez, and a single male in the British Museum from the same locality agrees perfectly with the description. The venation of the elytra in this species is very much like that in *Prostethophyma cephalica*, Bol. (see fig. 1, A).

2. *Aulacobothrus africanus*, sp. n.

♂. Smaller, but less slender, than any of the known Indian representatives of the genus. Antennæ a little longer than the head and pronotum together. Head strongly reclinate; frontal ridge in profile perfectly straight, forming a rounded acute angle with the fastigium, distinctly sulcate and rugosely punctured throughout; its margins raised, not punctured, parallel, slightly convergent at the fastigium. Fastigium of the vertex rotundo-pentagonal, distinctly broader than long; its surface slightly concave; median keel low, rather thick, but irregular, interrupted in the middle of the fastigium, prolonged all across the occiput; lateral occipital keels distinct, but very irregular, not nearly reaching the pronotum; temporal foveolæ very distinct, much longer than broad, parallel, with the apex obliquely rounded. Pronotum rather compressed laterally, but without a constriction; its disc smooth, but dull in the prozona, and strongly rugosely punctured in the metazona, median keel running throughout the pronotum, distinctly raised, shining, cut just behind its middle by the third sulcus; lateral keels rather feeble and irregular, slightly convex and feebly convergent between the fore margin and the first sulcus, scarcely perceptible, subparallel between the first and second sulci, distinctly convex and not strongly divergent behind the latter, not reaching the hind margin; fore margin of the pronotum rounded; hind angle straight; lateral lobes very coarsely punctured, less so in the middle where the punctures are not dense, and two elongate spots near the upper margin are not punctured at all, smooth; lower margin of the lobes obtusely angulate behind its middle; their hind angle straight, rounded; the fore angle obtuse, rounded. Mesopleuræ and metapleuræ very coarsely punctured. Elytra extending just a little beyond the hind knees; mediastinal area occupying the basal third of the fore margin, dilated in its middle, with a distinct false vein; scapular area occupying a little more than three-quarters of the fore margin, strongly dilated beyond its middle, with regular oblique reticulation; externo-median area distinctly dilated, the middle radial vein being slightly bisinuate; discoidal area extending far beyond the middle of elytra, narrow, sparsely but irregularly reticulate, with a very irregular false vein interrupted in many places; interulnar area much broader than the discoidal area, with sparse subparallel transverse venules. Hind femora rather slender, only slightly dilated basally. Supra-anal plate rotundato-triangular, slightly longer than its basal width, with margins convex. Cerci straight, extending a little beyond the apex of the supra-anal plate. Subgenital plate obtusely conical.

General coloration brownish. Head with a pale median fascia above, which is scarcely perceptible on the pronotum. Lateral lobes of the pronotum of a darker shade than its disc, somewhat blackish, except the lower fourth part, which is pale. Elytra hyaline, with veins brownish; the cells in the apical part with small brownish clouds. Wings hyaline, with a very faint yellowish tint at the base; apex feebly infumate. Hind femora on the outside unicolorous; the upper inner area with three blackish fasciæ, which extend also on to the upper outer area, but are there scarcely perceptible; the inside yellowish; the lower inner area orange-yellow; the knees entirely black inside and blackish with brownish lobes outside. Hind tibiæ brownish yellow, with the base and the apical half of the spines black. Abdomen reddish.

	♂ (type). mm.
Length of body	14
„ pronotum	3·5
„ elytra	11·5
„ hind femora	9
Maximal width of hind femora	2·5

The type is unique; it was taken at Bloemfontein, Orange Free State, 24. ii. 1918.

3. *Aulacobothrus* (?) *crassipes*, sp. n.

♂. Of the same size but slightly more robust than *A. africanus*, Uvar. (Antennæ in the type broken). Head distinctly reclinate; frontal ridge in profile slightly convex above the middle ocellum, forming a widely rounded right angle with the fastigium of the vertex; its surface strongly punctured throughout, distinctly impressed below the middle ocellum, slightly convex between the antennæ; its margins slightly raised, not punctured, gradually and feebly divergent from fastigium to the clypeus. Fastigium of the vertex rotundato-pentagonal, distinctly longer than broad; its surface distinctly impressed; the median keel starts from its hindmost part and extends almost to the pronotum, very feeble throughout; the lateral occipital keels feeble, very irregular, distinctly divergent backwards. Temporal foveolæ distinctly but not much longer than broad, with the apex widely obliquely rounded. Pronotum only feebly compressed laterally, not constricted, rounded; the median keel strongly raised, cut by the third sulcus in its middle; lateral keels very feeble and irregular, distinctly convergent between the fore margin and the first sulcus, divergent behind the latter, on the metazona developed in its foremost part only; the disc of pronotum distinctly tectiform, dull, indistinctly rugulose throughout; hind angle straight; lateral lobes indistinctly rugulose throughout, except in the hind upper part of the metazona, which is densely and rather coarsely punctured; their lower margin is very widely rotundato-angulate behind the middle; their fore angle obtuse, hind angle straight, both widely rounded. Mesopleuræ and metapleuræ slightly rugulose. Elytra reaching the hind knees; the mediastinal area extending almost to the middle of the fore margin, dilated in its middle, with a very distinct, straight, false vein; scapular area occupying more than three-quarters of the fore margin, strongly dilated beyond its middle, with very oblique, sparse veinlets; externo-median area slightly dilated; the first and second radial veins perfectly straight; the discoidal area extends distinctly beyond the middle of the elytra, rather broad, its transverse veinlets thick, more regularly disposed than in *A. africanus*, the false vein well developed, straight; the interulnar area about as broad as the discoidal, with two rows of cells and an irregular, interrupted false vein. Hind femora short, thick, and dilated basally. Supra-anal plate triangular, distinctly longer than broad, with margins straight. Cerci straight, about as long as the supra-anal plate. Subgenital plate obtusely conical.

General coloration greyish brown. Head above ash-grey, with two irregular brown fasciæ adjoining the lateral occipital keels externally ; broad blackish postocular fasciæ running right across the lateral lobes of the pronotum, occupying their upper half; their lower parts, as well as the face and cheeks, ash-grey. Elytra feebly infumate throughout, with all veins and veinlets brown. Wings hyaline, with a scarcely perceptible yellowish tint; the apex distinctly infumate. Hind femora with the area externomedia whitish, gradually merging into yellow towards the apex; its lower carina with three elongate brown spots before the preapical ring, while the upper carina is blackened ; the upperside grey, with two brown bands behind the middle and a yellow preapical ring extending all round the femur ; the inside reddish, with two black bands ; the outer lower sulcus orange-yellow; the inner lower sulcus red; the knees shining black all over, except the upper side, which is dull brown. Hind tibiæ bright red, with shining black condylus and apices of the spines, with a yellow subbasal ring and the apex, as well as the hind tarsi, pale olive. Abdomen reddish.

	♂ (type). mm.
Length of body	15
„ pronotum	3·5
„ elytra	12.
„ hind femur	9
Maximal width of hind femur ..	3

The type is unique ; it is from Bloemfontein, Orange Free State, 24. ii. 1918.

I am not quite sure whether this species actually belongs to the genus *Aulacobothrus* or is a member of the group Scyllinæ, near to *Phorenula*, since the inner lower spur of its only tibia is broken.

THE GROUP *SCYLLINÆ*.

Prof. I. Bolivar in his recent revision of the Old World Truxalinæ founded a new group for the genera characterised by the inner lower spur of the hind tibiæ being much longer than the inner upper one and straight, with the apex only curvate (see fig. 2, B); he called this group Prostethophymæ*, but it is more reasonable to adopt for that group the name Scyllinæ, which has been long applied to the group of American genera characterised by the same shape of the tibial spurs.

This peculiar group seems to be fairly well represented in

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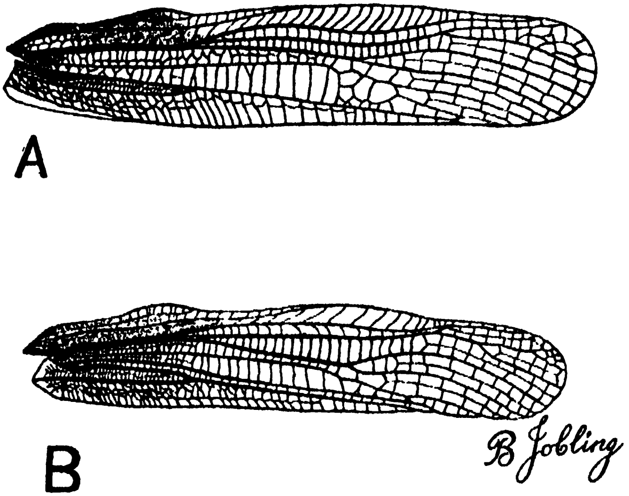
* *L. c.* pp. 44 & 48.

South Africa, whence three genera (i. e., *Prostethophyma*, *Berengueria*, and *Phorenula*) have been described by I. Bolivar, and two more are described in the present paper.

1. *Prostethophyma cephalica*, Bol. (Fig. 1, A.)

This species is represented in the British Museum by a good series of specimens taken by Dr. G. A. K. Marshall at Salisbury, Mashonaland; Bolivar's type belongs evidently to the same lot, and the Museum specimens proved to be entirely identical with the specimens in the Oxford collection designated by Bolivar himself as cotypes.

Fig. 1.



A, *Prostethophyma cephalica*, Bol.; B, *P. minor*, sp. n.

As I. Bolivar gives the dimensions of the female only, I think it useful to give a full table of dimensions, as follows:—

	♂.	♀.
	mm.	mm.
Length of body	19	25
„ head	3·5	4
„ pronotum....	4	5
„ elytra	16	19
„ hind femur ..	12·5	15·5

The dimensions are taken from cotypic specimens.

2. *Prostethophyma minor*, sp. n. (Fig. 1, B.)

♂. Smaller and more slender than *P. cephalica*, Bol. Antennæ extending well beyond the hind margin of the pronotum. Head very strongly reclinate; frontal ridge parallel throughout, scarcely narrowed at the fastigium, where it is strongly convex and sparsely punctured, while the rest is flat, with a very shallow impression below the middle ocellus and covered with strong, though not dense, impressed points; face strongly punctured, but less so than in *P. cephalica*; facial keels reaching the clypeus. Fastigium of the vertex as in *P. cephalica*; temporal foveolæ scarcely perceptible, indicated by puncturation. Median keel of the pronotum low and rather thick, interrupted in its middle by the typical sulcus; lateral keels feeble, distinctly (and more than in *P. cephalica*) convergent towards the first sulcus, strongly divergent behind, not reaching the hind margin, both front and hind part of each keel being straight; hind angle of the pronotum obtuse. Venation of the elytra much like that in *P. cephalica*, but differing in the following points: externo-median area more dilated, twice as broad as the scapular area and subequal in its width to the interulnar area, which is less dilated than in *P. cephalica*; discoidal area a little wider than in *P. cephalica*, and regularly transversely venulated except the very base.

Coloration as in *P. cephalica*, but paler. Lateral lobes of the pronotum with only an elongate pale callous spot below the middle, instead of a more narrow longitudinal callous line extending across the lobes as in *P. cephalica*. Elytra hyaline, spotless, with the apex strongly infumate and with a pale callous streak in the basal half of the scapular area. Wings as in *P. cephalica*. Hind femora on the outside greyish yellow, with brownish points along the upper carina; the upperside with very indistinct transverse fasciæ; the inside orange-red, with a blackish fascia before the apex and a blackish spot at the middle of the upper margin; the lower sulcus of the femora yellowish; the hind knees black. Hind tibiæ with black condylus, pale basal third, bright red in the rest.

♀ (paratype). Differs from that of *P. cephalica* by the smaller size and some characters in the venation of the elytra: the hind radial vein is more bent backwards and the externo-median area is therefore broader and with regular transverse reticulation; the discoidal area is regularly transversely reticulated, without a false vein at all (or with but an irregular one in the basal half).

	♂ (type). mm.	♀ (paratype). mm.
Length of body	16·5	20·5
„ head	3·5	3·5
„ pronotum	4	4·5
„ elytra	14	16
„ hind femora	10	13

The type and paratypes (3 ♂♂ and 2 ♀♀) were taken by Messrs. C. P. Lounsbury and J. C. Faure at Boshof, Orange Free State, 17–18. v. 1917.

Key to the Species of the Genus Prostethophyma, *Bol.* (Fig. 1, A & B.)

1 (2). ♂. The externo-median area of the elytra twice as broad as the scapular area and subequal in its width to the interulnar area; the discoidal area with regular transverse venulation.

♀. The externo-median area broader than in the second species, regularly transversely venulated; the discoidal area regularly transversely reticulated, without a false vein .... *P. minor*, Uvar.

2 (1). ♂. The externo-median area less than twice as broad as the scapular area and much narrower than the interulnar area; the discoidal area irregularly reticulated.

♀. The externo-median area narrower than in the preceding species, rather irregularly reticulated; the discoidal area with irregular reticulation and a more or less developed false vein .... *P. cephalica*, Bol.

3. *Phorenula cruciata*, Bol.

I refer to this species a series of specimens in the British Museum from Zomba, 2000–3000 ft., though I cannot be quite sure of my identification, because Bolivar's description contains nothing but colour characters, which are, according to his own remark, very variable; anyhow, the Zomba specimens agree with the description fairly well, and I do not feel justified in describing them as another species. The correct interpretation of Bolivar's unsatisfactory description of this species is rendered still more difficult because he compares it with *Ph. vittata*, which has never been described. Fortunately, I have received from the Oxford Museum one specimen labelled by I. Bolivar as the cotype of *Ph. vittata*, which enables me to give a description of it below.

In the first place, however, I may make some remarks on the genus *Phorenula*. In I. Bolivar's opinion, the principal distinction between this genus and *Prostethophyma* is in the structure of the temporal foveolæ, which are supposed to be well developed, impressed, and perfectly marginated in *Phorenula*, and imperfectly; or not all marginated, shallow and punctured in *Prostethophyma*. My study of a rather long series of *Prostethophyma cephalica*, Bol., which is the type of the genus *Prostethophyma* and of *Pr. minor*, sp. n., enables me to conclude that this character is far from being constant in these species, not even being reliable as a specific character, and therefore quite useless for separating the genera. There remains, therefore, only one character for separating *Phorenula* from *Prostethophyma*, and that is in the venation of the elytra, especially in the shape of the discoidal area, which is equally wide throughout in *Phorenula* and narrowed apically in *Prostethophyma* ; the difference is a very striking one in the case of the males, but the females of the two genera are extremely alike, and the question arises whether the genera *Phorenula* and *Prostethophyma* should not be better united. I prefer, however, to keep them separate in the meantime, till more species are made known (and I am sure that this group is represented in South Africa by a far greater number of species than is at present recorded), and especially because I have not yet had the opportunity of studying the genotype of *Phorenula*, for which I should take *Ph. dorsata*, Bol., as the first of the two species described under this genus.

4. *Phorenula vittata*, sp. n.

1911. *Phorenula vittata*, I. Bol. *in litt.*, Mém. Soc. Ent. Belg. xix. p. 82.

♂. Rather small for the genus, distinctly compressed laterally. Antennæ scarcely longer than the head and pronotum together, rather thick. Head strongly reclinate. Frontal ridge rather broad, parallel, feebly narrowed at the fastigium, where it is distinctly convex, while elsewhere it is flat, with the margins obtuse, not reaching the clypeus; surface of the ridge not densely punctured. Fastigium of the vertex perfectly rounded, slightly impressed, with a median keel beginning from its middle and running across the occiput, but not reaching the pronotum; the lateral margins strongly convergent behind, and prolonged into two irregular lateral occipital keels; temporal foveolæ shallow, rhomboidal, with rounded angles. Pronotum laterally compressed but not constricted; median keel very well developed, rather thick and distinctly raised, interrupted by the hind sulcus just before the middle; lateral keels well developed, callous, distinctly convergent towards the first sulcus and strongly divergent behind it, deeply cut by all three sulci, not reaching the hind margin of the pronotum; fore margin distinctly convex; hind margin rectangular; surface of the disc uneven, with rather large impressed points, with callous rugosities between the sulci; lateral lobes strongly rugulose and punctured, with a callous irregular longitudinal keel in the middle, starting just behind the front margin, slightly sinuate in the middle and almost reaching the hind margin. Elytra extending a little beyond the hind knees; mediastinal area reaching the apex of the basal third, dictinctly dilated beyond its middle, with a false vein; scapular area almost reaching the apex of the elytra, well dilated in the middle and strongly attenuate apically, with sparse oblique veins; externo-median area narrow, feebly widening towards the apex, with sparse transverse reticulation; discoidal area distinctly shorter than half the whole elytra, scarcely hyaline, with rather scarce but not parallel transverse venules, without a regular false vein; interulnar area a little broader than the discoidal, sparsely but irregularly reticulated, with a very irregular and only partly-developed false vein. Hind femora narrow, with the apical third attenuate.

General coloration light chocolate-brown. Occiput with two longitudinal rows of brown points. A broad castaneous-black fascia starts from the hind margin of the eyes and runs across the upper half of pronotal lobes; sides of mesonotum and metanotum also partly black; the lower part of the pronotum lobes pale, with brown punctures, and sharply separated from the dark upper part by the longitudinal keel, which is ivory-coloured; disc of the pronotum with brown points; lateral keels and a little interspace between them and the castaneous lateral fascia ivory-coloured. Elytra light fawn; scapular area with oblique venules partly brown; discoidal area shining black, with a few hyaline spots in the apical half; three irregular and not sharply-defined brownish spots along the middle of the apical half. Wings hyaline, scarcely infumate apically. Pectus and abdomen brownish beneath, with brown points; abdomen of the same colour above, but more strongly dotted with brown. Fore and middle legs with dark grey and brown points and streaks. Hind femora with the area externomedia whitish, with a grey median longitudinal streak ; upperside with more than the apical half brown, interrupted in the middle of the femur by a narrow pale fascia ; the upper inner area with black base ; inner median area blackened apically ; lower areas buff; the knees spotted with black, more so on the inside. Hind tibiæ black from beneath, the colour gradually diluting towards the apex ; the upperside is yellowish grey, dotted and spotted with brown; an incomplete black subbasal ring.

Female unknown.

	♂ (type). mm.
Length of body..........	15·5
,, head..........	3
,, pronotum	3·5
,, elytra	14
,, hind femora ..	10

The type is from Pretoria, iv. 1921 (*J. C. Faure*). A cotypic male in the Oxford collection, labelled by I. Bolivar as a cotype of *Ph. vittata*, I. Bol. (undescribed), is from Salisbury, Mashonaland, 5000 ft., 1899 (*G. A. K. Marshall*); it agrees with the type in all characters, but is in less good condition, which caused me to draw up the description from another specimen.

5. *Phorenula marshalli*, sp. n.

1911. *Phorenula marshalli*, I. Bolivar *in litt.*, Mém. Soc. Ent. Belg. xix. p. 81.

♂. Antennæ a little longer than the head and pronotum together. Head strongly reclinate ; frontal ridge flat, subparallel, slightly widened above the middle ocellus and feebly narrowed at the fastigium, coarsely punctured except at the base, at the apex, and along the margins, which are scarcely raised. Fastigium of the vertex regularly oval, scarcely shorter than broad, slightly impressed, with a feeble arched transverse sulcus, with margins perfectly rounded, incurved behind and emitting two irregular callous occipital keels; the median keel starting from the apex of the fastigium, but lowered in its middle, prolonged into an occipital keel, which is connected with the lateral keels by several irregular callous transverse ridges ; temporal foveolæ rather well developed, longer than broad, elongato-trapezoidal, with rounded angles. Pronotum scarcely compressed laterally, without a constriction; prozona a little shorter than metazona; median keel well developed, rather sharp; lateral keels rather feeble and irregular, subparallel between the fore margin and the first sulcus, feebly divergent between that and the third sulcus, and more strongly divergent and better developed in the metazona, reaching the hind margin; obtusangularly rounded; hind angle straight, with the sides slightly concave; lateral margins of the disc not coincident with the lateral keels, but indicated by a slightly raised line running outwardly and below the lateral keels; surface of the disc neither punctured nor rugulose, smooth but shining; lateral lobes rugulose throughout. Elytra extending a little beyond the hind knees; their venation very much like that of the above-described *Ph. vittata*, Uvar., but the discoidal area a little longer, though still not reaching the middle of the elytra, with an irregular false vein throughout; interulnar area with only one row of rather regular cells and without any trace of a false vein. Hind femora thick and short, with only apical fourth attenuate.

General coloration greyish fawn, with a brown and black design. Along the head and pronotum runs a paler median fascia, included between two velvety black fasciæ, which start from the sides of the fastigium, coincide with the lateral keels in the prozona, and run within these on the metazona, where the keels are pale. Face, sides of the head, lateral lobes of the pronotum, mesonotum, and metanotum unicolorous, indistinctly dotted with grey points. Pectus and the base of the abdomen of the general colour, though of lighter shade; the apical half of the abdomen reddish both above and beneath, but the apex itself yellowish. Fore and middle legs fawn, without any spots or points. Hind femora with three well-pronounced black fasciæ on the upperside, the hindmost of them being partly extended on the externo-median area; that area of the general coloration with a few black points along the lower carina; the inner side bright red, except the preapical ring, which is ivory and extends all round the femur; the knee brown above, black inside, black with brown lobes on the outside. Hind tibiæ bright red, with black base, a broad ivory subbasal ring, and black-tipped spines. Hind tarsi buff. Elytra with the basal half of the mediastinal area slightly darkened; discoidal field with a row of irregular brown spots; an oblique brownish fascia beyond the middle; the apical fourth infumate, with a faint indication of oblique fasciæ. Wings distinctly infumate at the apex and to the middle of the outer margin.

	♂ (type). mm.	♀ (paratype). mm.
Length of body	16	20·5
„ head	3	3·75
„ pronotum	3·5	4·5
„ elytra........	14	18
„ hind femur ..	11	14

The type is from Salisbury, Mashonaland, 11. xi. 1905 (*G. A. K. Marshall*); four other paratypic males and two females are from the same locality; one female from Pretoria, iv. 1921 (*J. C. Faure*); one female from Morico, Transvaal, i. 1918.

The dimensions of the female given above are taken from the specimen labelled by I. Bolivar as a cotype of *Ph. marshalli*, Bol. (undescribed). This specimen and some others of the series are not so vividly coloured as the type; the black fasciæ on the head and pronotum may be very little developed or altogether wanting. The inside of the hind femora is sometimes orange-red. The interulnar area in the male is sometimes less regularly reticulated and with an indication of a false vein.

6. *Phorenula gracilis*, sp. n.

♂. Smaller than any other known species. Antennæ extending a little beyond the hind margin of the pronotum. Frontal ridge flat, with very obtuse margins, feebly narrowed at the fastigium, with rather large but sparse puncturation. Fastigium of the vertex oval, with the apex somewhat acute, feebly impressed, with a very feeble, arched, transverse sulcus; its margins convergent behind and emitting irregular lateral occipital keels; median keel beginning behind the arched sulcus and prolonged on to the occiput, but not reaching the pronotum; temporal foveolæ fairly well developed, rotundato-rhomboidal, narrowed anteriorly and posteriorly. Pronotum neither compressed laterally nor constricted; median keel strongly raised, cut by the typical sulcus just before the middle; lateral keels well developed, distinctly convergent between the fore margin and the first sulcus and strongly divergent behind that sulcus, almost reaching the hind margin; actual lateral margins of the pronotal disc indicated less distinctly than in *Ph. marshalli*, Uvar.; fore margin of the pronotum rounded; hind angle straight; the surface of the disc neither rugulose nor punctured, smooth but not shining; lateral lobes coarsely punctured and rugulose. Elytra extending a little beyond the hind knees; their venation as in *Ph. marshalli*, but the interulnar area is narrower, not broader than the discoidal area, with an irregular reticulation and an irregular false vein. Hind femora narrower than in *Ph. marshalli*, but broader than in *Ph. vittata*, Uvar., with the apical third attenuate.

General coloration brownish with black design; the latter much like that of *Ph. marshalli.* A light buff median fascia, included between the two dark castaneous fasciæ, runs across the head and pronotum; lateral keels of the latter pale throughout; lateral lobes brownish, variegated and dotted with brown. · Elytra with a longitudinal median row of rectangular black spots along the discoidal area and almost to the apex. Wings with the apex but feebly infumate. Head beneath, pectus, and the base of the abdomen light olivaceous; the rest of the abdomen orange-reddish beneath and above. Fore and middle legs variegated with brown. Hind femora on the upperside with a basal brown spot and with the whole apical half brown, except a narrow transverse fascia just beyond the middle of the femur, and a narrow pale subapical ring; the externo-median area brownish, with numerous indistinct brown points, with a row of elongate black spots along the lower carina; the inside brownish with a faint reddish shade, with indistinct brown points; lower sulcus greyish olivaceous; the knees brown, with the upperside and lobes of a lighter shade. Hind tibiæ greyish olivaceous, with brown base and numerous indistinct brownish points; their spines black. Hind tarsi somewhat reddish.

♀ (paratype). Differs from the male by the far darker coloration, being almost black above, but lateral keels of the pronotum still pale; lateral lobes with the lower margin and a streak in the middle pale; their whole median part black. Elytra mostly shining black, with a median row of hyaline spots along the discoidal area; the base of the scapular area buff. Wings a little more infumate than in the male. Abdomen and the inner and lower side of the femora more orange-reddish. Hind tibiæ slightly reddening towards the apex.

	♂ (type). mm.	♀ (paratype). mm.
Length of body	14	20
„ head	2·5	3
„ pronotum	3	4
„ elytra........	13	16
„ hind femora ..	10	13

The male type and the only paratypic female are from Salisbury, Mashonaland, xi. 1905 (*G. A. K. Marshall*).

This species seems to be closely related to *Ph. cruciata*, Bol., and may prove even to be conspecific with it, but the question cannot be solved without the examination of Bolivar's type, and I prefer to give here a description of my specimens which will render it possible later to establish the synonymy. If my specimens are actually conspecific with *Ph. cruciata*, Bol., then the insect from Zomba mentioned above represents a distinct and undescribed species.

As I have not seen both of Bolivar's species of the genus *Phorenula*, I think it inadvisable to attempt to draw up a key to the species, which must be necessarily incomplete and therefore might only mislead.

PACHYCARUS, gen. nov.

Small and middle-sized grasshoppers, with a thick head, somewhat resembling in habitus and type of coloration certain species of the Palæarctic genus *Dociostaurus*, Fieb.

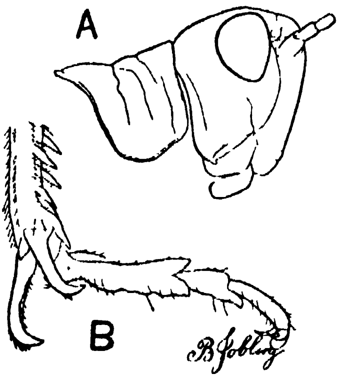
Antennæ filiform, with the subbasal joints slightly compressed, but not at all dilated, in ♀ distinctly, in ♂ very much longer than the head and pronotum together. Head large and thick, distinctly prominent above the pronotum, in ♂ strongly, in ♀ distinctly reclinate. Frontal ridge in the male flat or feebly impressed, gradually widened towards the clypeus, almost reaching the latter; in the female it is more convex, with margins obtuse and disappearing shortly below the middle ocellus. Fastigium of the vertex distinctly sloping forwards, pentagonal, more or less distinctly marginate and impressed; temporal foveolæ visible from above, longer than wide, shallow, imperfectly marginated. Occiput without median carina. Eyes shortly ovoid; their height exceeds only a little their length and is subequal to the height of the infra-ocular part of cheeks. Pronotum short, rounded, feebly selliform; median keel very low, in prozona undeveloped or distinctly more feeble than in metazona; the first and second transverse sulci not reaching the median keel, which is cut by the typical sulcus in its middle; hind margin widely rounded; lateral lobes distinctly higher than long, narrowed downwards, with the lower margin rotundato-angulate on the middle, and both fore and hind angles obtuse, rounded. Prosternum with a low transverse swelling on its fore margin. Mesosternal lobes perfectly transverse, about twice as broad as long, with hind angles very widely rounded; interspace scarcely more narrow than the lobes, widened posteriorly.

Metasternal lobes separated by a subquadrate interspace. Tympanum semi-open. Elytra developed, but not exceeding the hind knees; mediastinal area with a basal dilatation; scapular area dilated, especially in the males, extending almost to the apex of elytra; discoidal area reaching beyond the middle of elytra, parallel; interulnar area subequal in width to the discoidal. Wings hyaline, with normal venation. Hind femora short and thick; the knee-lobes rounded. Hind tibiæ very slightly thickened apically, rounded above, bicarinate below, armed with 8–9 outer and 10–11 inner spines; the lower inner spur almost straight, almost as long as the first tarsal joint, slightly incrassate near the apex, which is short and recurved. Supra-anal plate of the male obtusely triangular, about as long as broad, with the sides slightly convex; cerci rounded, obtuse, subequal to the supra-anal plate; subgenital plate short, obtusely conical. Subgenital plate of the female much longer than broad, widened posteriorly; its hind margin with an obtuse triangular projection in the middle; valvæ of the ovipositor very short, thick, and obtuse.

Genotype: *Pachycarus stauronotus*, sp. n.

To the same genus belong two more South African species: one of them has been described by W. F. Kirby as *Heteropternis* (sic!) *pallida*, Kirby (Ann. & Mag. Nat. Hist. vol. x. no. 57, 1902, p. 241, no. 4), and the other, which has been recorded by Kirby as *Calliptamus minor*, Walk. (Trans. Ent. Soc. London, 1902, p. 240), has nothing to do with the genus *Calliptamus*, and is described below as *Pachycarus intermedius*, sp. n.

Fig. 2.



A, *Pachycarus stauronotus*, sp. n.; B, *P. medius*, sp. n.

Key to Species of the Genus Pachycarus, *Uvar.* (Figs. 2 & 3.)

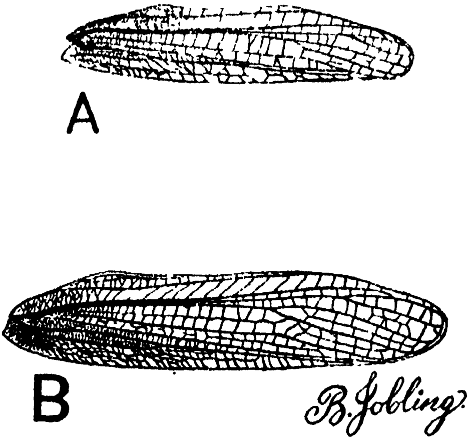
1 (2). The sides of the fastigium (tempora) distinctly sloping sideways, narrow and occupied entirely by the temporal foveolæ, which are distinctly narrowed anteriorly and imperfectly margined below.

3 (4). ♂. Elytra without false veins in the discoidal and interulnar areas. Fastigium of the vertex distinctly longer than broad. (♀. Discoidal area irregularly reticulated without a false vein; the interulnar area with an irregular false vein. Fastigium of the vertex slightly longer than broad.) . *stauronotus*, sp. n.

4 (3). ♂. Elytra with false veins in the discoidal and interulnar areas. Fastigium of the vertex only a little longer than broad (♀ unknown.)........................ *medius*, sp. n.

2 (1). ♀. The sides of the fastigium only feebly sloping sideways, broad, with broad obtuse margins; temporal foveolæ parallel, not narrowed anteriorly, obtusely but completely margined all around. The mediastinal, scapular, discoidal, and interulnar areas with false veins................ *pallidus* (Kirby).

Fig. 3.



A, *Pachycarus stauronotus*, sp. n.; B, *P. medius*, sp. n.

7. ***Pachycarus stauronotus***, sp. n. (Figs. 2, A; 3, A.)

♂. The smallest of the three known species. Antennæ reaching well beyond the middle of the abdomen. Head longer and thicker than the pronotum, strongly reclinate and very prominent above. Frontal ridge with the margins closely approximate at the fastigium; facial keels reaching the clypeus. Pronotum very finely and closely punctured in the prozona, and more distinctly in the metazona, which is a little shorter than the prozona; median keel scarcely perceptible on the prozona and more distinct, though still very low, on the metazona. Elytra a little longer than the abdomen; mediastinal area with but very feeble basal dilatation and reaching to the apical fourth of the fore margin; scapular area fairly dilated, extending a little beyond the end of the mediastinal, with sparse transverse nerves; externo-median area gradually widening towards the apex, but distinctly narrower than the scapular area; discoidal area fairly broad, sparsely, though not very regularly transversely, reticulated; interulnar area a little narrower than the discoidal, sparsely and still less regularly reticulated, without a regular false vein.

General coloration greyish brown, with grey and whitish design. Head brown above and whitish beneath. Pronotum brown above, with a very faint indication of a pale cross-like design (as in *Dociostaurus genei*, Ocsk.); lateral lobes with a reniform ivory spot beneath and a little behind their middle, with the fore angle white and the lower margin whitish. Elytra with a row of rather large quadrangular brownish spots along the middle, with the base of mediastinal area and the whole of the anal area brownish. Wings hyaline, with the principal veins in the fore part brownish. Sternum and abdomen bright yellow beneath; upperside of the abdomen bright red. Fore and middle legs spotted and fasciated with grey. Hind femora bright yellow beneath and on the inside; the externo-median area whitish, with a row of several small brown spots along the lower margin; superno-median area brownish, with a grey spot in the middle, another smaller and less distinct grey spot adjoining the pale base, and the third one still less distinct, just before the pale preapical ring; the median and preapical spots are also prolonged into the superno-interior area; knees black. Hind tibiæ pale greyish, with black base and a brown streak in the basal third beneath; the spines brown. Hind tarsi bluish white.

♀ (paratype). Antennæ extending well beyond the hind margin of the pronotum, but not reaching the middle of the abdomen. Head a little longer and distinctly thicker than the pronotum, very prominent dorsally. Facial keels not reaching the clypeus. Prozona of the pronotum with the median keel a little more distinct than in the male. Elytra reaching the apex of the abdomen, but a little shorter than the hind femora; mediastinal area feebly dilated basally, with an incomplete false vein; scapular and externo-median areas dilated about in the same degree as in the male; discoidal area fairly dilated, with two rows of cells and an irregular false vein; interulnar area slightly narrower than the discoidal, with the cells in two rows and an irregular false vein. General coloration more varied than in the male; face dotted with brown; head with a pale median line and two postocular fasciæ of the same colour; the pale cross on the pronotum more distinct. Elytra with more numerous brown and black spots. Pectus and abdomen greyish yellow beneath; upperside of the abdomen red, but not so bright as in the male. Hind femora with three distinct dark brown transverse spots on the upperside, and with three indistinct oblique greyish streaks along the middle of the externo-median area; knees grey, with pale lobes dotted with brown. Hind tibiæ as in the male, but their base is grey instead of black.

	♂ (type). mm.	♀ (paratype). mm.
Length of body	13	18
„ head	3·25	3·5
„ pronotum	2·75	3·25
„ elytra	8·5	12
„ hind femora ..	9·5	11

The type and several paratypes are from Petrusville, 23. i. 1919; other paratypes are from Boshof, 17–18. v. 1917; Paardeburg, 31. v. 1917; and Dealesville to Bloemfontein, 19. v. 1917. The series consists of 10 ♂ ♂ and 9 ♀ ♀.

The morphological characters are rather constant in the whole series, but the size and coloration vary. Thus, the above-described female is rather small, since there are specimens measuring 22 mm. in length of body. The general coloration is sometimes more brownish or even ochraceous, with more or less numerous dark spots; the cross-like figure on the pronotum is always more pronounced in females than in males, but also varies in its distinctness. The abdomen in some females is not reddish above. On the whole, the species is extremely like *Dociostaurus genei*, Ocsk., but easily distinguished from it by the spurs of the hind tibiæ and by the form and position of temporal foveolæ.

8. *Pachycarus medius*, sp. n. (Figs. 2, B; 3, B.)

♂. Larger and more robust than *P. stauronotus*, Uvar. Antennæ reaching to the middle of the abdomen. Head about as long as the pronotum and only a little thicker than it, strongly reclinate and distinctly prominent upwards. Frontal ridge at the fastigium narrowed, but not as strongly as in *P. stauronotus*. Facial keels reaching the clypeus. Metazona of the pronotum rugulose; median keel or prozona hardly perceptible, on metazona well developed though low. Elytra a little longer than the abdomen and almost reaching the hind knees; mediastinal area with the basal dilatation more prominent than in *P. stauronotus*; discoidal area more dilated than in that species, with an irregular but complete false vein; interulnar area distinctly narrower than the discoidal area, with an irregular false vein; anal area with an indication of a false vein.

General coloration reddish brown. Face ash-grey. Pronotum with a very faint indication of a paler cross; lateral lobes with a rather indistinct oblique dark streak, their lower part somewhat paler than the rest. Sternum buff; abdomen yellow beneath and red above. Elytra and wings as in *P. stauronotus*. Hind femora yellow beneath, reddish elsewhere, especially so on the inside; the upperside with three grey transverse fasciæ; knees black. Hind tibiæ muddy yellow, with brown spines. Hind tarsi brownish.

	♂ (type). mm.
Length of body	17·5
„ head	4
„ pronotum	4
„ elytra	12·5
„ hind femora	12

The type is from Pretoria (*W. L. Distant*); another paratypic male is labelled Zoutpansberg (*Kaessner*), and differs from the type in the reddish shade of its coloration, the hind tibiæ being red. Both were identified by W. F. Kirby as *Calliptamus minor*, Walk., and recorded by him as females (Trans. Ent. Soc. London, 1902, p. 240).

9. *Pachycarus pallidus* (Kirby).

1902. *Heteropternis pallida*, Kirby, Ann. & Mag. Nat. Hist. vol. x. no. 57, p. 241, no. 4.

This is the largest and most robust species of the genus, easily separated from the other two by the structure of the tempora. As its coloration has been already described by Kirby, I will give here only a few principal morphological characters which are entirely lacking in Kirby's description.

♀. Head subequal to the pronotum in length, but distinctly thicker, feebly reclinate. Frontal ridge convex, disappearing just below the median ocellus, very feebly narrowed at the apex; facial keels not nearly reaching the clypeus. Pronotum with the median keel developed throughout, though on the prozona it is somewhat less sharp than on the metazona. Elytra scarcely reaching the end of the abdomen and much shorter than the hind femora; mediastinal area very distinctly dilated, with a well-developed false vein; scapular area well dilated, with an irregular false vein; discoidal area rather broad, with an irregular but rather thick false vein; interulnar area much narrower than the discoidal, with a false vein; anal area with a well-developed, thick false vein.

As for the coloration, it has been described by Kirby fairly correctly, though I should call the general coloration ochraceous rather than light brown, and the design on the pronotum and hind femora is not blackish but brown; there is on the disc of pronotum a faint indication of a pale cross, not mentioned by Kirby. The hind tibiæ are dark yellow; the phrase in Kirby's description—"hind femora with black-tipped spines"—means, of course, not femora but tibiæ.

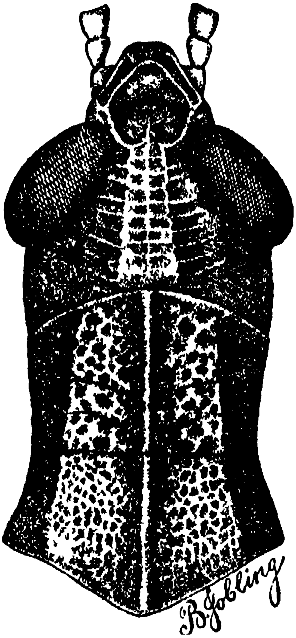
The type of this species (from Figtree, Barberton) is still unique.

FAUREIA, gen. nov. (Fig. 4.)

Body distinctly compressed laterally. Antennæ with the joints 3–7 distinctly flattened, feebly dilated, and almost smooth; the rest of the antennæ composed of cylindrical joints, strongly and densely punctured; the antennæ in ♂ slightly longer, in ♀ a little shorter than the head and pronotum together. Head strongly reclinate; frontal ridge with the sides obtuse, perfectly parallel, slightly approximated at the fastigium; fastigium of the vertex forming a rounded angle with the frontal ridge, nearly horizontal, pentagonal with the apex rounded, in ♂ longer than broad, in ♀ as long as broad, with an arched transverse impression; its margins raised, obtuse, in ♂ feebly, in ♀ more distinctly convergent backwards, not prolonged into occiput; a feeble median carinula begins from behind the arched impression and runs towards pronotum, but does not reach the latter; temporal foveolæ well seen from above, distinctly though not deeply impressed, marginate, more than twice as long as broad, with the upper and lower margins straight and parallel, hind angles straight, the apex obliquely rounded; eyes oval, with the fore margin straight, their height exceeding the height of the infra-ocular part of cheeks more than twice. Pronotum strongly compressed laterally; its disc nearly flat, slightly widened posteriorly and forming straight though rounded angles with the lateral lobes; the median keel well expressed throughout, rather thick, interrupted in about the middle by the typical sulcus; no distinct lateral keels, which are replaced by the smooth, straight lines along the lateral margins of the strongly punctured disc; fore margin of the disc very widely rounded, slightly prominent; hind margin rounded in the female and rotundato-angulate in the male; lateral lobes a little higher than long, feebly narrowed downwards, with the lower margin obtusely angulate in the middle, its hind part being horizontal, slightly excavate, and the fore part obliquely ascendant. Elytra fully developed, in both sexes extending a little beyond the hind knees, hyaline throughout; mediastinal area with the basal dilatation; scapular area strongly dilated in the male and less so in the female; discoidal area parallel, with an irregular and incomplete false vein; interulnar area in the male a little dilated, without false vein, in the female only slightly wider than the discoidal area, with a false vein. Wings with normal venation, coloured at the base. Prosternum with a large, though feebly prominent, transverse swelling. Mesosternal lobes in ♂ only slightly, in the ♀ distinctly transverse; their inner margins strongly rounded; hind angles rounded; hind margins nearly perpendicular to the sides of the sternum; mesosternal interspace much longer than its narrowest width, strongly widened anteriorly and posteriorly. Metasternal lobes in both sexes contiguous; their median suture long, straight. Tympanum semi-open. Hind femora only feebly incrassate basally; their apical third attenuate. Hind tibiæ distinctly widened towards the apex, armed with 8–9 outer and 10–11 inner spines; the lower inner spur almost straight, half as long again as the upper inner one and subequal to half the first tarsal joint. Supra-anal plate of the male much longer than broad, lance-shaped, with small lateral angles near the apex; cerci straight, slightly compressed laterally, a little longer than the supra-anal plate; subgenital plate obtusely conical. Upper valves of the ovipositor without, the lower with rounded teeth; the apices of all valves strongly curved, sharp; subgenital plate of the female much longer than it is broad, widened towards the apex, which is rounded with a triangular median projection.

Genotype: ***Faureia rosea***, sp. n.

Fig. 4.



Faureia rosea, sp. n.

10. ***Faureia rosea***, sp. n. (Fig. 1.)

♂. Frontal ridge between the antennæ slightly convex, with a few tiny impressed points; from a little above the median ocellus downwards it is impressed and coarsely punctured; the lowest part is again almost smooth and flat. Occiput feebly transversely rugulose. Pronotal disc coarsely punctured, especially on the metazona, where the points are smaller but more dense than on the prozona; the middle part of the latter is without puncturation but not shining; lateral lobes rugulose throughout, with three oblong dull impressions in the fore upper part. Elytra with the mediastinal area reaching a little beyond the basal third of the fore margin, with a dilatation in the middle and a well-developed false vein; scapular area extending to the apical fourth, strongly dilated, with rather dense and irregular reticulation at the base and with a few sparse oblique venules in the apical two-thirds; externo-median area feebly dilated, with sparse transverse venules; discoidal area narrow, slightly narrowed and feebly bent backwards apically, irregularly and rather densely reticulated in the basal two-thirds, where an irregular false vein is perceptible, while the apical third is entirely hyaline, with a few transverse venules; interulnar area about twice as broad as the discoidal, with sparse, not very regular, transverse venules; axillar area with a false vein.

General coloration buff. A darker fascia runs from the hind margin of the eye across the upper half of the lateral lobes of pronotum and the sides of mesonotum and metanotum. Wings with the basal half rose, the colour gradually fading outwardly. Hind femora pale, unicolorous, with ash-grey semilunar spots on the knees. Hind tibiæ pale sanguineous; their base pale, with a dark streak on the upperside; the spines white with the apical half black. Hind tarsi sanguineous.

♀ (paratype). Frontal ridge less distinctly impressed than in the male. Mediastinal area of the elytra reaching the base of the apical third; discoidal area a little broader than in the male, with the irregular false vein almost reaching its apex; interulnar area only a little broader than the discoidal, with two rows of rather large but irregular cells, separated by a false vein reaching the apex. In other respects agrees with the male type, but without the dark lateral fascia on the head and pronotum; this fascia is not constant in both sexes and the general coloration is sometimes with a greenish shade.

	♂ (type). mm.	♀ (paratype). mm.
Length of body	19	23
„ pronotum	4	5
„ elytra	17	20
„ hind femora	12	14

The male type and 9 paratypic specimens of both sexes were taken in April 1921 near Pretoria by Mr. J. C. Faure, and I have great pleasure in naming this very distinct new genus after that entomologist. There is also one male in the British Museum, taken also at Pretoria by Mr. W. Distant and named by Mr. F. Kirby as *Anthermus granosus*, Stål (this is one of three specimens recorded in Trans. Ent. Soc. London, 1902, p. 101, no. 99, the two others being named correctly).

XXXVII.—*Brief Descriptions of new Thysanoptera.*—XII.

By Richard S. Bagnall, F.R.S.E., F.L.S.

This is continued from Ann. & Mag. Nat. Hist. ser. 9, vol. vii. pp. 355–368, and the following species are described:—

Physothrips minor, sp. n.
„ *andrewsi*, sp. n.
Megathrips honoris, sp. n.
Bactridothrips serraticornis, sp. n.
Elaphrothrips antennalis, sp. n.
Dicaiothrips crassiceps, sp. n.
„ *breviceps*, sp. n.

Suborder Terebrantia.

Physothrips minor, sp. n.

♀.—Length about 1·0 mm.

Belonging to the *P. usitatus* group.

Colour dark brown; fore-tibiæ pale yellowish, lightly shaded with grey-brown basally, intermediate and hind-tibiæ at tips and all tarsi pale yellow; third antennal joint pale yellow, for the most part shaded with grey. Fore-wing dark grey-brown, excepting basal fifth or thereabouts, where it is light.

P. antennatus type.—Eyes coarsely facetted, pilose; ocelli large, interocellar setæ situated between posterior ocelli, long and stout. Maxillary palpi long and slender.

Antennæ as in *antennatus*, Bagn., but joints 3 and 4 not so strongly produced distally; 4 longer than any other joint; 3 apparently short on account of being very broad near middle; 5 with a very short stem-like constriction; relative lengths of 3 to 8 approximately 39 (with stem) : 46 : 33 : 41 : 8 : 13. Forked trichomes on 3 and 4 stout.

Upper vein with a series of setæ running to the distal third and two at tip; those of posterior vein long, commencing at the second setæ of the upper vein.

Abdominal segments 8–10 obconical; terminal setæ long and strong, those on 9 approximately 1·4 times the length of the segment. Eighth tergite posteriorly without fringe.

This species comes near to *P. antennatus*, Bagn., and *P. antennalis*, Karny, and is distinguished from both by the small size and the relatively shorter joint 4 of the antennæ.

Type. In Coll. Bagnall.

Hab. INDIA, Maddur, Mysore, 30. viii. 1918, and Coimbatore, 7. ix. 1918, single females with *Dendrothripoides ipomeæ*, sp. ined., on *Ipomea staphylina* (*Ramakrishna*).

Physothrips andrewsi, sp. n.

♀.—Length c. 1·4 mm.

Belonging to the *P. vulgatissimus* group, having the antennal joints 3 and 4 long, slender, and fusiform.

Colour uniform dark brown; fore-wings brown, with the basal fourth or more light, practically clear. Antennæ brown, joint 2 yellowish distally, 3 wholly light greyish-yellow, and 4 basally greyish-yellow to light yellowish-brown. Anterior legs wholly light greyish-yellow, intermediate pair also light, but with the fore margin shaded to a deepish brown—chiefly medianly; posterior pair with the femora dark brown, lighter distally, and the tibiæ greyish-yellow.

Head transverse, dorsal surface irregularly transversely striated; ocelli placed well back, interocellar setæ short and stout, about equal in length to the width separating them. Antennæ about 2·5 times as long as the head, relative lengths of joints 2–8 approximately as follows:—44 : 72 (with pedicel) : 68 : 44 : 65 : 5 : 7. Intermediate joints slender, very approximately of uniform breadth. Maxillary palpi long, relative lengths of joints approximately 21 : 12 : 20.

Pronotum transverse, approximately 1·3 times as long as the head and about 0·8 as long as broad. Surface transversely striated, sparingly and minutely setose, bristles at each hind angle subequal in length, long and stout, between 0·55 and 0·6 the length of the pronotum. Legs somewhat stout, especially the anterior pair; regularly setose. Hind tibiæ with series of spines in the distal two-thirds (or thereabouts) within, closely set, moderately long and stout, and numbering a dozen or more, the terminal pair very long and stout. Setæ of fore-wing somewhat long and stout, 1 + 1 + 1 in the distal half of the upper vein, 24–26 and 12–15 on the costa and lower vein respectively.

Abdomen oblong-ovate, terminal bristles long.

Easily distinguished from *vulgatissimus* by the coloration of wings and legs. It comes very near indeed to the Japanese *P. pallipes*, Bagn., and differs chiefly in the coloration of head and thorax, the longer intermediate antennal joints, the longer pronotum (14 : 10), the longer pronotal bristles, whilst there are differences in the chætotaxy of the head. Both *pallipes* and *albipes* possess a stoutish pair of setæ behind posterior ocelli which are not developed in this species, whilst the interocellar pair is longer and not placed so far forwards in *andrewsi*.

Type. British Museum of Natural History (Imperial Bureau of Entomology).

Hab. INDIA, Ringtong, T. E., Darjiling Dist., India; on rose, 14. vi. 1916, ♀ ♀ only. Reg. no. 287.

Suborder TUBULIFERA.

Megathrips honoris, sp. n.

Syn. *M. quadrituberculatus* in part.

In referring *Idolothrips quadrituberculatus* to the genus *Megathrips* I described a ♂ example which, despite certain colour-differences, I presumed to be referable to the species *quadrituberculatus*. This male example is described in this series of descriptions, Part VIII. (Ann. & Mag. Nat. Hist. ser. 8, vol. xvii., May 1916, pp. 406–407), but further material has produced ♂ examples of another species of *Megathrips* agreeing in the type of coloration with *M. quadrituberculatus* and undoubtedly referable to that species.

♂.—Length (including tube) 4·5 mm.

Fore-tibiæ brown excepting at apex and basally; intermediate tibiæ brown except at apex, and hind-tibiæ brown except the extreme base and distal third, which are yellow. Antennæ more than twice as long as the head; relative lengths of joints 3 to 8 as follows:—61 : 50 : 45 : 33 : 16 · 14.

Abdominal segment 6 furnished with a pair of lateral spine-like tubiform processes at anterior angles, slightly outwardly directed, but scarcely curved, and not quite reaching the line of the posterior margin; 8 with a pair of lateral tooth-like processes near posterior angles.

Tube about 1·5 times as long as head, stout near base, but sharply narrowed in the first fourth, more strongly setose (and with longer setæ) than in *quadrituberculatus*. Terminal hairs short.

Type. In Coll. Bagnall.

Hab. Japan, Kobe; 1 ♂, April 1915. Reg. no. 139 (*J. E. A. Lewis*).

Megathrips quadrituberculatus (Bagn.).

As shown above, the ♂ example referred to this species proves in the light of further material to be another species. Mr. Lewis captured two examples of each sex of the true *M. quadrituberculatus* by sweeping grass at Kobe on June 30th, 1916—so I am able to characterize the male.

♂.—As in ♀. Sixth abdominal segment widened before middle and furnished with a pair of stout tubiform processes curving outwards and not reaching the line of the posterior margin of 7; 7 with a minute tooth at each posterior angle, and 8 slightly widened near middle and then produced to a stout tooth before posterior angles.

Differs from *M. honoris* in the coloration of the tibiæ, the more massive armature of abdominal segments 6 and 8, in the weaker chætotaxy of the tube, which is also longer in this species compared to the length of head.

Genus BACTROTHRIPS, Karny.

Syn. *Krinothrips*, Bagn. 1918.

On account of the pressure of the past five years, due to war conditions, I am afraid that in my last contribution to this series I erected the genus *Krinothrips* quite overlooking Karny's *Bactrothrips*, though it was previously known to me. *Krinothrips* must be regarded as a synonym of *Bactrothrips*, but the description establishes the fact that Karny's diagnosis was based upon a male example, the ♂ differing from the ♀ in exactly the same way as do ♂ ♂ of *Megathrips* and allied genera.

Bactrothrips divergens (Bagn.).

Bactrothrips longiventris, Karny, is a smaller insect than *B. divergens* (Bagn.), and differs in several directions, including the colouring of the tibiæ, which are all yellowish in the distal half in Karny's species. The tubiform abdominal processes of the male appear to vary in size.

I have recently received examples of *B. divergens* from the Imperial Bureau of Entomology (no. 163), taken in plenty on cacao in the Belgian Congo (*R. Mayné*).

Bactridothrips serraticornis, sp. n.

Karny has recently diagnosed the genus *Bactridothrips* for a Malayan insect, the male differing from that sex in the genus *Bactrothrips* in the longer processes of the sixth abdominal segment and the armature of segments 7 and 8.

A single ♂ example from Ceylon was recently sent me by Mr. Green which would seem to differ from *B. idolomorphus*, Karny, in several particulars.

♂.—Length about 7·0 mm.

Head 2·5 times as long as broad (as against 2·3 in *idolomorphus*); antennæ very slender, nearly three times as long as the head, with the joints 6 and 7 relatively longer than in *idolomorphus*, the relative lengths of joints 3–8 being approximately 69 : 50 : 43 : 30 : 13 : 11, as compared with 68 : 48 : 42 : 27 : 10 : ?.

The tibiæ are golden-yellow in colour, the fore-tibiæ being shaded with brown in the basal two-thirds and the intermediate and hind pairs are dark brown in the basal half and basal two-fifths (or thereabouts) respectively. All tarsi similarly yellow, with the ends (or second joints) dark brown.

The horns of the sixth abdominal segment are much shorter than in *idolomorphus* (a line drawn across their tips would only approximate the base of the teeth of the seventh segment), whilst the inner margins are noticeably and irregularly serrate in the basal three-fourths or thereabouts. The teeth of the eighth abdominal segment are very much stronger and stouter than those on the seventh, whilst the sides at middle are inclined to be tuberculate.

The tube is approximately twice as long as the head and 8·0 times as long as broad at base; the surface is strongly setose excepting in the distal fifth, the basal half only being setose in Karny's species.

The legs are not so long as shown in *idolomorphus*, and upon careful measurement the intermediate and hind-tibiæ (without tarsi) measure 0·9 mm. and 0·77 mm. respectively, as compared with 1·25 mm. and 0·95 mm.

Type. In Coll. Bagnall.

Hab. CEYLON, Pundaluoya; 1 ♂ only (*E. E. Green*).

Elaphrothrips (*Idolothrips*) *antennalis*, sp. n.

♂.—Length about 3·7 mm.

Colour blackish-brown, with the fore-femora distally and all tarsi lighter; antennal joints 3 and 4 yellow, with the apical two-fifths or thereabouts of 4 light brown; 5 yellow in the basal half.

Form much as in the North-American species *Idolothrips tuberculatus* and *flavipes*, Hood. Head much as in *flavipes*, just upon twice as long as broad; cheeks with several short spines; postocular bristles set well in and close to the eyes, long and slender, at least 1·5 times the length of an eye. First antennal joint stout compared to 2; the elongate-clavate segment 3 peculiar because of a rounded swelling of the inner margin in the neighbourhood of the basal third; relative lengths of the joints 3 to 8 approximately as follows:—49 : 46 : 40 : 28 : 19 : 18. Trichomes long and very slender.

Pronotum about 0·45 the length of the head, transverse, and twice as broad as long. Mid-lateral and postero-marginal bristles at least well-developed, but difficult to make out in the preparation; pale. Outer postero-marginal about 0·85, the inner pair shorter and more slender, and the mid-lateral 0·5 the median length of the pronotum. Fore-legs not very strongly incrassate, fore-tarsus armed with a broad-seated tooth. Wings practically colourless, broad, and reaching to the sixth abdominal segment; fore-wings with a series of thirty-five duplicated cilia. Pterothorax broad. Abdomen heavy, broader than the pterothorax, and gradually narrowing from the fifth segment. Tube about 0·9 the length of the head; somewhat heavy, with side subparallel to the distal third, whence it narrows sharply; about 0·65 as wide at tip as across middle. Terminal hairs weak, approximately 0·65 as long as the tube. Abdominal bristles long, light yellow in colour, the longest on segment 9 as long as the tube. Ninth sternite (or pleurites?) apparently produced in the form of a pair of blunt spine-like processes, one on each side of the tube.

The shape of the third antennal joint is a peculiar feature of this species.

Type. In Coll. Bagnall.

Hab. JAPAN, Kobe; 1 ♂, 11. vii. 1916, on grass (*J. E. A. Lewis*). Reg. no. 293.

Dicaiothrips crassiceps, sp. n.

♀.—Length about 5·5 mm.

Dark blackish brown, end of tube and tarsi somewhat lighter. Segment 3 of antennæ yellow, with a ring of light brown at base, and the apex dark brown, concolorous with the following segments; wings apparently clear, at most lightly tinged (the tips only protrude over the sides of the body in the single preparation); cilia smoky.

Head short and broad, only 1·7 times as long as broad, cheeks faintly incurved behind eyes and then as gently arched, set with a few strong spines. Eyes prominent, finely facetted, occupying about 0·3 the length of the head; post-ocular bristles long, 1 5 times as long as an eye. Antennæ 2·3 times as long as the head, relative lengths of joints approximately as follows:—51 : 40 : 35 : 30 : 19 : 14.

Pronotum about 0·5 as long as the head; setæ well-developed, colourless, the outer postero-marginal pair about 0·8 and the mid-lateral 0 5 as long as the median length of pronotum; pair at anterior angles shorter. Pterothorax stout, transverse. Wings broad, reaching to sixth abdominal segment, with cilia very closely set. Femora irregularly spinose; fore-tarsus with tooth.

Abdomen heavy, broader than pterothorax, gradually narrowing posteriorly. Tube long and slender; 1·2 times as long as the head and about 4 times as long as broad near base; terminal hairs long and slender, 0·65 as long as the tube, and abdominal bristles on segment 9 yellowish brown; very long, 1·4 times the length of the tube. Other abdominal bristles moderately long, colourless or nearly so.

Recognized by the remarkably short and broad head. Only three other species are known to me wherein only the third antennal joint is yellow—namely, *denticollis*, Bagn., *falcatus*, Karny, and *seychellensis*, Bagn.

Hab. INDIA, Myawadi, on the Burmo-Siamese frontier, at 900 feet, 24–26. xi. 1911 (*F. H. Gravely*). 4303, Reg. no. 174. One ♀ only.

Dicaiothrips breviceps, sp. n.

♀.—This species closely resembles *D. crassiceps*, m., but the head is not so broad compared to the length, being 1·9 times as long as broad near base.

Although the specimen is almost certainly female, the fore-legs are fully developed, the fore-tarsus being armed with . long stout tooth. The antennæ are unfortunately broken off in the unique example.

The tube is much shorter and stouter than in *D. crassiceps*, being approximately as long or nearly as long as the head, 3·0 times as long as broad at base, and about 2·5 times as broad at base as at tip. All abdominal bristles lightly coloured (colourless), those on 9 being 0·8 the length of the tube.

Comes near *D. crassiceps*, but readily distinguished by the slightly narrower head, the shorter tube, and the shorter bristles on the ninth segment of the abdomen. I hope to describe this specimen more fully when dealing with Messrs. Alluaud's and Jeannel's collection.

Hab. BRITISH EAST AFRICA, Nairobi (Wa-Kikvyu et Masai) (*Ch. Alluaud*, 1904).

XXXVIII.—*Note on a Freshwater Sponge from New Zealand.* By R. KIRKPATRICK.

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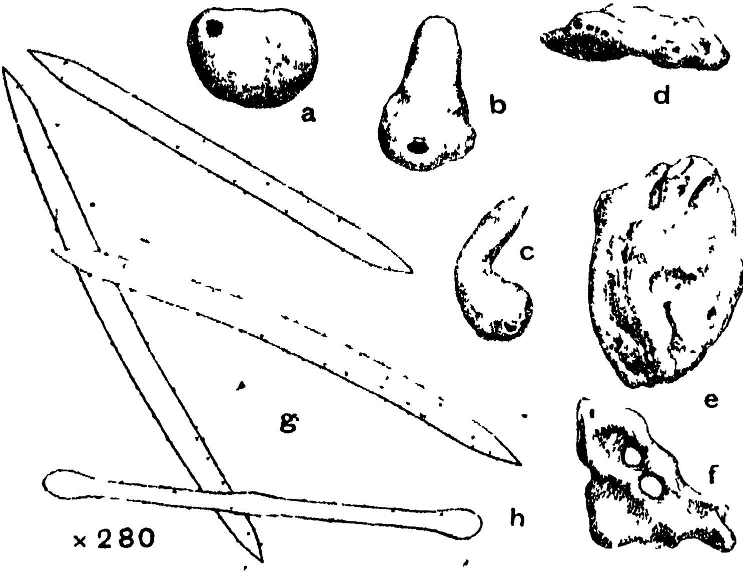
RECORDS of freshwater sponges from New Zealand are so rare that it seems worth while calling attention to any fresh discoveries, even if only of new localities for a known species.

Early in the year numerous small specimens of a freshwater sponge were sent to the Natural History Museum, London, by Mr. H. Hill, of Napier, N.Z.

The specimens were gathered on the north shore of Lake Taupo. The lake, which is situated in the centre of North Island, is 1210 feet above sea-level, has an area of 140 square miles, and a depth of 300 to 530 feet.

The specimens had been stranded after a gale. They are about a square inch in area and an inch high. Some specimens form thin flat crusts without visible oscules, others are conical, with one large oscule, and others, again, are irregular and meandrine (see text-figure). The texture is fairly firm, and the body permeated with fine sand. No gemmules were present in this lot of material.

Two months later Mr. Hill sent a further consignment. Gemmules were now found, and the sponge was at once recognized as *Ephydatia kakahuensis*, Traxler (Termés. Füzetek. 1896, xix. p. 102, pl. ii.). The sponge described by Traxler came from the River Kakahu in the South Island.



Ephydatia kakahuensis, Traxler.

a–f, specimens ½ natural size: **a**, **b**, **c**, conical, with one large oscule, **d**, lamellar; **e**, thinly encrusting; **f**, irregular, **g**, spined tornote oxeas, × 280; **h**, exceptional shape, viz amphityle, × 280.

Accordingly, New Zealand continues to have only one known species of freshwater sponge, this being found both in the North and South Island.

It is to be hoped that Mr. Hill, who intends to dredge in Lake Taupo, will add to the number of species.

XXXIX.—*On the Anatomy and Affinities of* Hypsobia nosophora. By G. C. Robson, B.A.

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INTRODUCTION.

In 1915 Leiper and Atkinson (6), in extending and confirming Miyairi's original conclusions with regard to the transmission of Asiatic Schistosomiasis (=Bilharziasis), announced that part of the life-cycle of *Schistosoma japonicum* was passed in the tissues of a Japanese freshwater snail. This snail was described by the present author (10) as *Katayama nosophora*, and a short account of the radula, shell, and operculum was given.

In May 1915 Pilsbry (9) referred this form to *Blanfordia*, and in 1918 Annandale (2) placed the species in Heude's *Hypsobia*. There can be little doubt that the mollusc in question should be referred to the genus described by Heude under that name.

As no complete account of the structure of this animal has apparently been published, and the descriptions of Heude and the present author were only slight and confined principally to external features, it has been thought desirable to issue some detailed account of its anatomy. In addition to its rôle as intermediate host to *Schistosoma japonicum* and as a member of a group of Mollusca the anatomy of which is very little known, the discovery by Cort (4) of its powers of resistance to dessication rendered the study of its respiratory system an inviting subject.

It is not the object of this paper to discuss the nomenclature of this group of Gastropoda, as the amount of information upon the structure of E. Asiatic *Paludestrina*-like molluscs is too scanty to justify a taxonomic discussion.

It is open to those interested in nomenclature to criticize Pilsbry's reference of this form to *Blanfordia* or to inquire whether Heude's genus should not be called *Blanfordia*; but, until we have a general knowledge of the structure of all the genera involved in this question, such discussions appear a little premature.

The publications of Bregenzer (3), Seibold (13), and the present author (11, 12) serve to show that there are several characters of fundamental importance which cannot be neglected in the classification of the *Paludestrina*-forms; and it is very much to be regretted that in his admirable survey of the freshwater Hydrobiidæ of India (1) Dr. Annandale should have ignored such characters as the nervous system and female genitalia.

The author is indebted to Dr. W. W. Cort, of the Johns Hopkins University, for sending living examples of the snail and for information concerning its mode of life.

STRUCTURE.

I. *Alimentary System.*

The general disposition of the *mouth* and its adjacent area resembles that found in the Paludestrinidæ. The mandibles, the epithelium which secretes the oral cuticle, and the two lateral diverticula of the mouth are in general like those of *Paludestrina jenkinsi* (11) or *ventrosa* (12). The mandibles consist of seventeen to twenty-one columnar pieces of specialized cuticle.

The secretory epithelium is continuous with that of the pharynx.

Posteriorly to the mandibles the mouth widens out and is flattened over the oral cartilages. It shows the tripartite arrangement seen in other Paludestrinids. The median portion has a thin non-ciliated roof, and the lateral portions dip down beside the cartilages.

The *salivary glands*, of which there is a single pair, open into the lateral divisions just behind the level of the radula and cartilages. They come into intimate connection with each other across the œsophagus; but it is doubtful whether actual organic fusion occurs.

The *buccal cartilages* are symmetrical and joined in the median line. Laterally they are somewhat flanged upwards, while posteriorly they are divergent.

The *radula* has been described elsewhere (10), while that of *H. humida* was figured by Heude (5). In the material forwarded by Dr. Cort there was a tendency for the animals to show one less denticulation on the two outer teeth than is shown in the original description of *H. nosophora*.

The *stomach* corresponds in its general structure with that of other Paludestrinidæ, though the apertures of the œsophagus and hepato-pancreas are not so close together as in *Paludestrina*. The point of entrance of the œsophagus was rather variable in the individuals examined. The cuticular lining, the marked transverse ridge of the upper portion of the stomach, and the position and structure of the *style-sac* are remarkably similar to the condition seen in *Paludestrina*. The communication between the pylorus and style-sac characteristic of the latter genus is also found in *Hypsobia*. The layer of dark pigment-granules in the stomach epithelium of *Paludestrina* and *Bythinella* (3, 12) was not found in this genus, though its absence may be due to accidental causes.

The *intestine* exhibits a typhlosole. The rest of the alimentary and digestive system does not call for special comment.

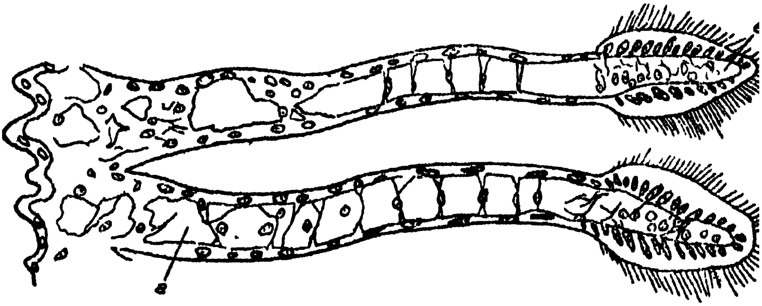
II. *The Respiratory System.*

The character of the *gill* constitutes the most remarkable feature in the structure of this animal, and differentiates

Hypsobia at once from *Paludestrina* in this respect. The author is not inclined, however, to regard it as of very great taxonomic importance. The points of agreement between the two genera are so numerous that the specialized nature of the respiratory apparatus in *Hypsobia* may, on the whole, be disregarded for classificatory purposes.

As in *Littorina* (8) and *Hemibia* (5), the filaments of the gill are prolonged across the roof of the mantle-cavity to the rectal border. This modification of the gill has been very fully discussed by Pelseneer (*loc. cit.*); and according to his description the condition seen in *Hypsobia* and *Hemibia* is comparable exactly to the stage illustrated by *Littorina*, in which each filament is reduced in height and continued right across the pallial cavity, but has not yet broken up into the vascular arborizations seen in *Cerithidea*.

Fig. 1.



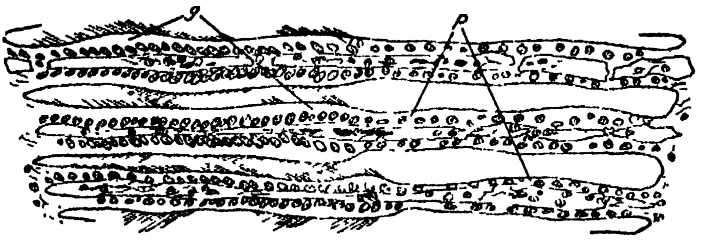
H. nosophora ($\frac{1}{12}$ hom. imm. × 4 oc.).

Section through two gill-lamellæ. *a*, afferent vessel; *e*, efferent vessel.

I propose to refer to the "filaments" or "lamellæ" of the true gill, and to call the ridges by which they are continued "paractenidial" folds or filaments. There are from forty-eight to fifty-four lamellæ. Each of these in side-view appears as an oblong, slightly bent plate tapering to a blunt point at the right-hand end. This end is actually free, though supported by the paractenidial filaments. The vascular system of each filament consists, as usual, of dorsal afferent and ventral efferent vessels, with an intermediary system of lacunæ (fig. 1). In general, the condition seen resembles that in *Bythinella dunkeri* (3) and *P. ventrosa* (12), though the walls are much thicker and the spaces more confined than in those forms. The paractenidial folds differ from the above in having no expanded ciliated portion. Otherwise they do not differ from the true gill. The lacunar system is continuous from the filaments into the paractenidial folds (fig. 2).

The afferent vessels are derivatives of an irregular lacunar system communicating with the ample rectal sinus.

Fig.2.



H. nosophora.

Horizontal section through base of gill-lamellæ (*g*) and paractenidial filaments (*p*).

All that is known of the habits of this animal points to its being amphibious. Heude says of the Chinese species that it does not live in water, but on damp rocks. No such details of the actual mode of life of the Japanese species are available; but Cort (4) has shown that it will leave the water voluntarily and can resist dessication for about three months.

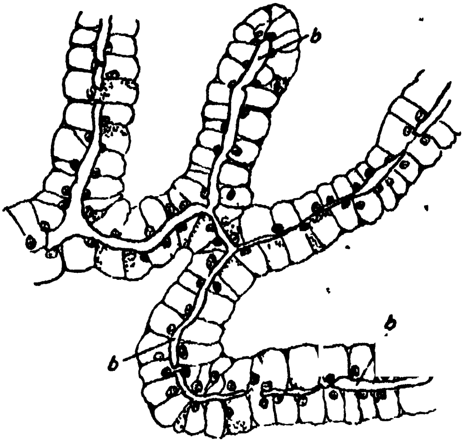
III. *Renal System.*

The *kidney* is rather remarkable among the *Paludestrina*-like forms on account of its complexity. In all the specimens examined it was possible to distinguish three areas, which were, however, by no means constant in their distribution or histological condition.

1. *Trabecular Portion.*—This consists of a number of cavities separated by a trabecular system covered by the same type of epithelium as the open portion of the kidney. In the walls of these cavities are found numerous blood-spaces (fig. 3).
2. The "*blood-gland*" is a compact stroma usually lying near the renal aperture at the anterior end and on the outer side of the kidney next to the body-wall.

3. The *urinary cavity* ("Urinkammer") resembles that found in the Paludestrinidæ. It ramifies among the other organs, and is lined by a characteristic epithelium composed of vacuolated cells with basal nuclei.

Fig. 3.



H. nosophora ($\frac{1}{12}$ hom. imm × $\frac{1}{4}$ oc.).

Part of trabecular area of kidney. *b* = blood-spaces.

IV. *Circulatory System.*

The *pericardium* is situated in the usual position. No trace of a reno-pericardial aperture was found, though it is not certain that it is absent.

The *auricle* and *ventricle* are normal. The latter is very muscular and its cavity is traversed by numerous muscle-fibres. Some indication is seen of an auriculo-ventricular valve.

The distribution of anterior and posterior aortæ is normal, the anterior running forwards over the roof of the pericardium for some distance, then accompanying the œsophagus to open into the cephalo-pedal sinus. The posterior aorta runs backwards between the stomach and intestine. It would appear that the portal vein enters the pulmonary vein before the latter reaches the auricle; but it is impossible to be absolutely certain of this point.

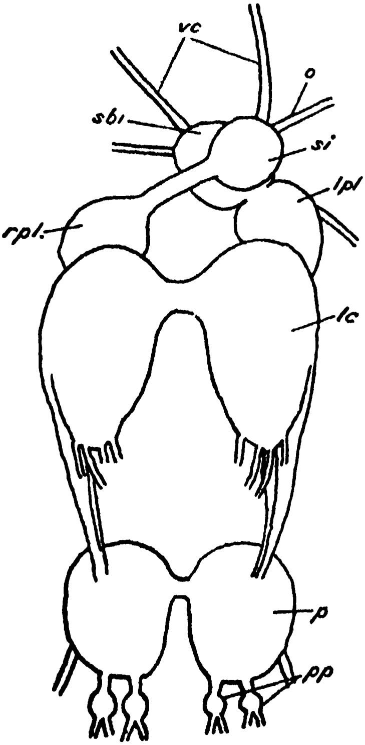
The cephalic and pedal portions of the *anterior* (*cephalo-pedal*) *sinus* are incompletely separated by a horizontal septum [*cf.* Robson (12)], which, as in the Paludestrinidæ, passes between the pedal ganglia and the cerebro-pleural complex.

V. *The Nervous System.* (Figs. 4 & 5.)

(a) *Sense-organs.*

1. *Osphradium.*—This is a small rod-shaped organ lying, as usual, on the left-hand side of the gill. It is innervated by a conspicuous nerve rising from the supra-intestinal ganglion.

Fig. 4.



H. nosophora. Central nervous system (anterior aspect).

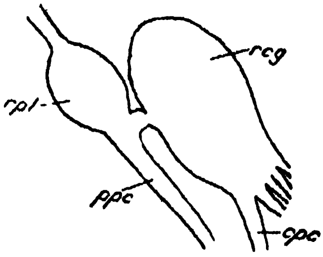
lc=left cerebral ganglion; *lpl*=left pleural ganglion, *p*=pedal ganglion; *rpl*=right pleural ganglion; *pp*=(sc.) parapodial and propodial ganglia, *si*=supraintestinal ganglion; *sbi*=subintestinal ganglion; *o*=osphradial nerve; *vc*=visceral commissure.

2. *Otocysts.*—These are found in the usual position on the posterior surface of the pedal ganglia. They contain a single otolith. The auditory nerve is very difficult to follow, and is apparently fused with the cerebro-pedal connective.
3. *Eyes.*—These are situated at the base of the tentacles and on the outer side. They consist of inner and outer cornea, a well-developed lens, and retinal layer.

(b) *Ganglia and Nerves.*

The cerebral ganglia are elongate and rather pointed anteriorly. They are placed with their long axes parallel to the main axis of the pharynx. They are connected in the median line by a small commissure. The pleural ganglia are closely applied to the cerebral ganglia, but are not fused to the latter. There are very short but distinct cerebro-pleural connectives [*cf.* discussion upon the latter in *Paludestrina ulvæ*, Robson (12)].

Fig. 5.



H. nosophora. Cerebro-pleural connective.

rpl=right pleural ganglion; *rcg*=right cerebral ganglion; *ppc* and *cpc*=pleural-pedal and cerebro-pedal connectives.

The cerebro-pedal and pleuro-pedal connectives are distinct, though very closely applied to each other. The pedal ganglia are rather round. They are closely approximated, being joined by a small commissure.

The supra-intestinal ganglion is joined to the right pleural ganglion by a commissure slightly longer than that figured by Bregenzer for *Bythinella dunkeri* (3). From this ganglion are given off the osphradial nerve and a connective to the abdominal ganglion.

The subintestinal ganglion is very closely approximated to the left pleural ganglion, but not fused to it.

The abdominal ganglion is situated between the anterior end of the kidney and the columellar muscle.

The cerebral ganglia give off anteriorly ocular, tentacular, and labial nerves, and connectives to the buccal ganglia.

It would appear that the penis-nerve is of cerebral origin, though it is impossible to make absolutely certain of this. It is possible that the tentacular nerve supplies branches to the musculature of the eye.

Each of the pedal ganglia gives off three main nerves, the two anterior ones bearing small ganglia at a short distance from their roots. These ganglia in their turn give off each two nerves which apparently innervate the plantar musculature of the foot.

VI. *Reproductive System.*

Male Organs.

The *spermatozoa* have long and tapering heads, differing therein from those of *Paludestrina* (1 2) and *Bythinella* (3), and agreeing rather with *P. taylori* (sc.=*Amnicola*) (Robson MS.). Whether they possess the extraordinarily long tail seen in the latter is, however, doubtful.

The *vas deferens*, after quitting the region of the testis, becomes progressively more slender. It passes into the *prostate*, which is of considerable size, and on quitting the latter it passes over the floor of the mantle-cavity and up the penis surrounded by a thick layer of circular muscle.

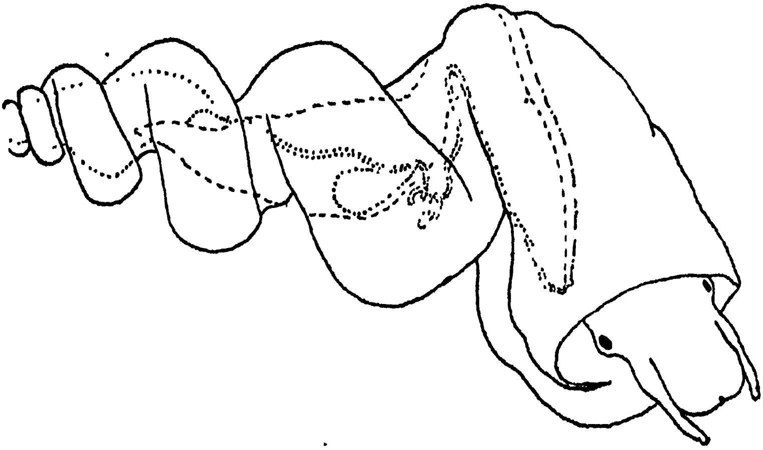
The *prostate* is very much folded. The cells lining its cavity are sparsely ciliated. It is difficult to be very certain about the histological elements composing this gland. In the first place, it usually showed differential staining, certain areas being more darkly stained than others. But it is impossible to say whether this was due to the presence of different types of cells or different physiological states of a single type of cell. It was possible to distinguish (*a*) vacuolated cells with the nucleus somewhat flattened out and found very often at the interior end of the cell (the end next the lumen of the gland), and (*b*) cells with eosinophilous granular cytoplasm, with the nucleus more usually rounded and occupying a more median position.

The penis is undivided, agreeing therefore with *Paludestrina*, *Hemibia*, *Delavaya*, *Stenothyra*, and *Tricula*, and differing from the Bythiniinæ (1). It is cephalic in position. In all the examples dissected it was rather broader and stouter than that figured for *H. humida* by Heude (5).

Female Organs. (Figs. 6 & 7.)

The *oviduct* follows the usual course downwards from the ovary. In the neighbourhood of the stomach it gives off a spermatheca of a rudely ovoid shape. The oviduct then becomes convoluted as in *P. ventrosa,* straightens itself out again, and runs parallel to the "uterus" and its glandular annexe along the right-hand side of the pallial cavity external to the "uterus." It terminates in a small aperture adjacent to the uterine aperture and anus. The lower end of the oviduct is very slender and its aperture exceedingly small, and it is very difficult to see how intromission is effected. Fertilization is internal, however, as spermatozoa may be frequently found in the spermatheca. It is similarly difficult to imagine how the fertilized ova find their way into the uterus, as they must first be shed into the pallial cavity and then be drawn into the uterus. The problem is the same in such forms as *Melania* and *Tanganyikia* (Moore, 7), in which a groove connects the oviducal aperture with the brood-pouch.

Fig. 6.

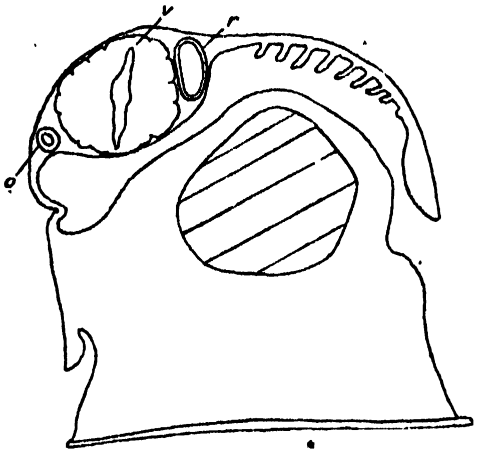


H. nosophora, × 22. Female reproductive system.
=ovary, oviduct, and spermatheca; - - - - - =accessory gland and uterus; -.-.-.-.-=rectum.

The author was at one time inclined to think that a connection existed in *Hypsobia* between the upper portion of the "uterus" and the oviduct in the neighbourhood of the receptaculum. But the connection between the two organs at this upper level, which was found in one or two examples only, appeared to be fortuitous, and, in any case, there was no continuous passage from the cavity of the oviduct into that of the "uterus."

Arising at a high level (occasionally adjacent to the lower end of the ovary) an extensive gland is found which passes downwards and eventually appears as an elongate mass on the right-hand side of the last whorl. It has a continuous cavity throughout the whole of its length, which opens to the exterior close to the anus and oviducal pore in the anterior right-hand corner of the mantle-cavity.

Fig. 7.



H. nosophora (×4 oc.×6 obj.). Diagrammatic transverse section through median region of pallial cavity.

o=oviduct; *r*=rectum; *v*="uterus."

It is impossible to discuss the identity and function of this gland without appropriately fixed material. It is evident, however, that it is divisible into two parts—an upper, wholly glandular portion, and a lower portion, less glandular, with a more capacious lumen and the remarkable feature of a well-developed muscular sheath imbedded in the glandular tissue.

The upper part usually stains a light blue with hæmatoxylin' the lower part an intensely dark bluish purple.

The author is inclined to regard the lower portion as a uterus* or brood-pouch. Although it is thick-walled and no eggs have been found in it, its lower portion in its position and relationship to the rest of the reproductive system resembles organs adapted for the reception and nutrition of the young, such as are found in neighbouring groups.

The *spermatheca* has a thick investment of circular muscle, and is usually composed of elongate secretory cells with basal nuclei. Spermatozoa were found in numerous examples, sometimes scattered throughout the cavity, sometimes clustered round the sides with their heads towards the periphery.

AFFINITIES.

Along with *Hypsobia* Heude gave incomplete descriptions of several new genera, such as *Delavaya*, *Hemibia*, and *Fenouilia*, some of which show certain points of resemblance to *Hypsobia*.

We have only a very slight knowledge of the structure of the other Asiatic *Paludestrina*-like forms. The information as to the European forms is a little more complete. It must, therefore, be admitted that these resources are scarcely adequate to enable us to form a clear concept either of the natural groups into which the Paludestrinidæ (Hydrobiidæ, auct.) may be divided or of the limits of the family itself†. Admitting, then, that the family may be rather indefinite in its boundaries, it nevertheless cannot be doubted that the characters of the alimentary canal (including mandibles, cartilages, and radula), nervous system, and genitalia at once assign *Hypsobia* to the Paludestrinidæ. In what subfamily it should be placed is rather more uncertain. Some of its characters suggest that it should take its place very near *Paludestrina* itself, and at least in the same subfamily (radula, mandibles, style-sac, nervous system, and male genitalia). On the other hand, the specialized respiratory system, the kidney, the female genitalia, and the character of the spermatozoa do not seem to warrant its inclusion in the Paludestrininæ. Yet among the adjacent subfamilies—Bythiniinæ, Mysorellinæ, &c.—there is none in which it might be placed with any confidence. If Heude's figure of the nervous system is to be trusted, *Hemibia*—with which *Hypsobia* shows such remarkable likeness in its specialized respiratory system—differs from *Hypsobia* in this respect as well as in the shell.

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* The upper portion may be an albumen- or a shell-gland, but for the time being the author prefers to call it the "accessory gland."

† The writer has had no opportunity of consulting Mr. B. Walker's "Synopsis of the Classification of the Freshwater Mollusca of North America," Mus. Zool. Michigan University, Misc. Publ. 6, 1918, p. 1.

It would seem better to regard *Hypsobia* as the representative of a subfamily distinct from the Paludestrininæ, but approximating to them more closely than to other subfamilies the structure of which is known to us.

CONCLUSIONS.

(1) *Hypsobia* is a genus referable to the Paludestrinidæ, but probably representing a separate subfamily.

(2) It agrees with *Hemibia* and *Littorina* in showing an adaptation to an amphibious mode of life in the structure of its gill and pallial cavity, which is in accordance with what is known of its habits.

(3) It possesses a crystalline style-sac exactly comparable to that of *Bythinella* and *Paludestrina*.

(4) The female generative organs are peculiar in two respects—the large accessory gland with (sc.) uterine fermination opening separately from the oviduct, and possibly comparable to the brood-pouch of other forms, and the muscular sheath imbedded in the glandular tissue of the latter.

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paper, with the first reference (without
c, and Iwakawa's paper on the nomenclature
d, 1918) were not available for reference.

XL.—*Exotic* Muscaridæ (*Diptera*).—IV.*

By J. R. Malloch, Urbana, Ill., U.S.A.

I have not adhered to my previous method in segregating the species from different continents under distinctive headings in this paper, as I have had to list a number of species under one generic name which have previously been placed in another genus, and for clarity have run the notes all under the generic name, thus preventing me from listing the species as heretofore.

Subfamily *Phaoniinæ*.

Phaonia peregrina, sp. n.

Female.—Black, shining, with grey pruinescence. Head black. Thorax quadrivittate. Abdomen faintly checkered. Legs black. Wings clear, veins yellow basally. Calyptræ yellowish. Halteres yellowish brown.

Eyes pubescent; frons normal; parafacial as wide as third antennal segment; longest hairs on arista longer than width of third antennal segment. Thorax without differentiated presutural acrostichals, with three pairs of postsutural dorsocentrals, prealar very long, some hairs adjacent to notopleurals, and hypopleura with some hairs on upper margin in front of spiracle. Abdomen normal. Fore tibia without a posterior bristle; fore tarsus without either long outstanding sensory hairs or erect dense curled hairs on posterior side of basal segment; mid-tibia with two posterior bristles; hind femur with strong bristles on apical half of anteroventral surface; hind tibia with one antero-ventral and two antero-dorsal bristles, the apical postero-dorsal bristle short and weak. Last section of fourth vein over twice as long as preceding section.

Length 6 mm.

Type, Willbrook, Natal, 8. iii. 1914 (*R. C Wroughton*).

One female.

Phaonia parvula, sp

Female.—Entirely black, shining, grey pruinescence. Thorax inconspic clear, both cross-veins distinctly cloud Halteres black.

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* For Part III., see Ann. & Mag. Nat. 1921, pp. 225–239.

Eyes almost bare; frons one-third of the head-width; each orbit with one backwardly directed supraorbital; parafacial at base of antenna nearly as wide as third antennal segment, becoming linear at middle of face, the latter concave in profile; longest hairs on arista shorter than width of third antennal segment. Thorax with two or three pairs of stout presutural acrostichals, three pairs of postsutural dorso-centrals, and no prealar; hypopleura bare. Fore tibia without a median posterior bristle; fore tarsus longer than fore tibia, without outstanding sensory hairs on posterior side of basal segment; mid-tibia with two posterior bristles; hind femur with four or five long bristles on apical half of antero-ventral surface, and a few setulose hairs on basal half of postero-ventral surface; hind tibia with two antero-dorsal and two or three antero-ventral bristles, calcar long. Wings normal.

Length 3·5 mm.

Type and paratype, Burpengary, Queensland, 5. xii. 1899 (*T. L. Bancroft*).

I desire to state that the poor condition of the paratype is due to an accident. When I had the specimen under the microscope, holding it by the long pin through the mount with my left hand, the electric lighting system suddenly failed owing to a violent thunderstorm that was raging that night and I was left in pitch darkness. In attempting to take hold of the head of the pin with my right hand to place the specimen back in the box I accidentally laid hold of the wrong pin, that upon which the specimen was mounted, in the dark, with the result that the specimen is now rather badly crushed, though recognizable.

Phaonia thomsoni, sp. n.

Male.—Black, slightly shining, with rather dense grey pruinescence. Head entirely black. Thorax quadrivittate. Abdomen with markings as in *serva*, Fallen. Legs black, the knee-joints reddish. Wings clear. Calyptræ whitish yellow. Halteres yellow.

Eyes densely hairy, separated at narrowest part of frons by a distance but little over width of anterior ocellus; parafacial at base of antennæ as wide as third antennal segment, widened below, the vibrissal angle much produced; cheek over twice as high as width of third antennal segment; arista with its longest hairs equal in length to width of third antennal segment. Thorax with three pairs of postsutural dorso-centrals, no strong presutural acrostichals; the prealar long, and some hairs on upper margin of hypopleura in front of spiracle. Abdomen ovate; basal sternite hairy. Fore tibia without a median posterior bristle; fore tarsus much longer than fore tibia, slender, no long sensory hairs along posterior side of basal segment; mid-tibia with four posterior bristles; hind femur with a series of antero-ventral bristles, and some long fine bristles on basal half of postero-ventral surface; hind tibia with two antero-dorsal and three or four antero-ventral bristles. Wings normal.

Length 7·5 mm.

Type, Kashmir, Gulmarg, 8500 feet, summer 1913 (*F. W. Thomson*)

Dedicated to the collector.

Phaonia kashmirensis, sp. n.

Female.—General colour as in the preceding species. All tibiæ and the hind femora reddish yellow, the latter infuscated apically.

Eyes short-haired; frons less than one-third of the head-width, with normal bristling, the interfrontalia almost bare on sides; parafacial wider than third antennal segment; vibrissal angle but little produced; longest hairs on arista distinctly longer than width of third antennal segment; proboscis stouter than usual (slender and elongate in *thomsoni*). Thorax with four pairs of postsutural dorso-centrals, in other respects as in *thomsoni*. Fore tibia without a median posterior bristle; fore tarsus slender, longer than fore tibia, with some outstanding sensory hairs along the posterior side of basal segment; mid-tibia with two posterior bristles; hind femur with a series of antero-ventral bristles; none on postero-ventral surface; hind tibia with two antero-dorsal and two or three antero-ventral bristles. Wings normal.

Length 8 mm.

Type, Kashmir, Gulmarg, 8500 feet, summer 1913 (*F. W. Thomson*).

This species belongs to the same group as *errans*, Meigen, while the preceding one belongs to a group intermediate between that group and the one containing *serva*, Fallén.

Phaonia flavomaculata, sp. n.

Female.—Shining black, with greyish pruinescence. Antennæ black, second segment brownish; palpi brownish yellow. Thorax quadrivittate, humeri, anterior third of pleura, and the scutellum, testaceous yellow. Basal abdominal tergite yellow except along posterior margin and on a narrow line in centre, second with two round yellow spots on dorsum, one on each side of median line. Legs yellow, tarsi fuscous. Wings clear, veins yellow at bases. Calyptræ and halteres yellow.

Eyes with short sparse hairs; frons one-third of the head-width above antennæ, narrower posteriorly, the bristling normal; parafacial narrow; vibrissal angle slightly produced; cheek not markedly higher than width of third antennal segment, the latter fully three times as long as second; longest hairs on arista about as long as width of third antennal segment. Thorax with three pairs of post-sutural dorso-centrals; presutural acrostichals absent, prealar very long; hypopleura bare; no hairs adjacent to otopleurals. Basal sternite bare. Fore tibia with two posterior bristles; fore tarsi slender, much longer than tibia, without outstanding sensory hairs on posterior side; mid-femur without long bristles on ventral surface; mid-tibia with two posterior bristles; hind femur with two or three preapical antero-ventral bristles and a few setulose hairs on basal half of postero-ventral surface; hind tibia with two antero-dorsal bristles and four or five antero-ventral setulæ, the calcar short, about one-sixth from apex to tibia. Wings normal.

Length 10 mm.

Type, Kashmir, Gulmarg, 8500 feet, summer 1913 (*F. W. Thomson*).

Phaonia abnormis (Stein).

This African species was originally placed in the genus *Mydæa* by Stein, and named *abnormis* because it has a strong postero-dorsal bristle on the hind tibia. As this is now accepted as the character for separating *Phaonia* from his concept of *Mydæa*, the specific name is rather inappropriate now.

I have seen a number of specimens from West Africa, where it is, to judge from the material sent to me, the commonest species of the genus, which is very poorly represented in Africa.

Genus Psilochæta, Stein.

This genus is known to me only through a female of *chalybea*, Wiedemann, and Stein's description.

The species known to me agrees with *Phaonia* in having the hypopleura hairy on upper margin in front of spiracle, the calcar present, prealar long, pteropleura bare, and in the bristling of the frons of the female. The only characters that appear to warrant its separation from *Phaonia* are the almost bare arista, well-developed presutural acrostichals, and the absence of long sensory hairs on basal segment of fore tarsus.

I can see no reason to accept the genus as distinct, if we do not also accept *Euphemia*, Robineau-Desvoidy, as such.

The specimen of *chalybea* before me bears a written label with the words "Coquimbo, Aristolochia" and the numbers 82–102.

Genus PTEROCANTHUS, nov.

Generic characters.—Belongs to the same group as *Trichopticus*, Rondani. Separable from it and allied genera by the presence of some long fine hairs on lower surface of first wing-vein at middle and on base of third vein above and below, and by having the lower surface of scutellum hairy—a character very rarely found in this subfamily.

Genotype, *Aricia sundewalli*, Zetterstedt.

Spilaria chætopygus, sp. n.

Female.—Similar to *lucorum*, Meigen, in colour. Antennæ and palpi black. Thorax quadrivittate. Abdomen with a slender dorso-central vitta and poorly defined lateral spots black. Legs black. Wings clear, not conspicuously yellow at bases, the cross-veins not infuscated.

Parafacials seen from in front much wider than third antennal segment. Prealar very short; postsutural dorsocentrals 4; sternopleurals 2 : 2. Fourth tergite with long but not dense bristles on disc. Fore tibia with a median posterior bristle; mid-tibia with three or four posterior bristles; hind femur with moderately long bristles on almost the entire length of antero-ventral surface, the postero-ventral surface almost bare. Outer cross-vein more distinctly curved than in *lucorum*.

Length 9 mm.

Type and paratype, Troodos, Cyprus, July–October 1902, about 4500 feet (*Miss D. M. Bate*).

Differs from *lucorum* in having the fourth tergite much more conspicuously bristled and the fore tibia with a median posterior bristle. Like all species which I have placed in the genus *Spilaria*, this one has a series of fine hairs on hypopleura below the spiracle and some hairs on sides of scutellum which invade the ventral surface slightly.

Spilaria punctifer, sp. n.

Female.—Black, subopaque, densely grey pruinescent. Frons opaque; antennæ black; palpi yellowish testaceous. Thorax quadrivittate. Abdomen checkered as in *lucorum*, Fallén. Legs yellowish testaceous, tarsi black. Wings clear, cross-veins broadly infuscated. Calyptræ whitish. Halteres yellow.

Frons at vertex less than one-third of the head-width, widened anteriorly, anterior orbital strongest; orbits with short setulæ laterad of the bristles; parafacial about as wide as the narrow third antennal segment, the latter about four times as long as second; arista with very long hairs above and below; eyes hairy. Thorax with three pairs of post-sutural dorso-centrals; prealar very small; scutellum with short hairs below on sides; sternopleurals 2 : 2, the lower anterior one small; hypopleura with short weak hairs below spiracle. Fore tibia with one or two posterior median bristles, the apical half of antero-dorsal surface with some short setulæ; mid-femur with one or two bristles on antero-ventral and four or five on postero-ventral surface on basal half; mid-tibia with four irregularly arranged posterior bristles; hind femur with four or five widely spaced antero-ventral bristles, and one near base on postero-ventral surface; hind tibia with two or three antero-dorsal and antero-ventral bristles. Costal thorn short; outer cross-vein straight.

Length 8·5 mm.

Type, Zomba, Nyasaland, ix. 1910, in house (*Dr. H. S. Stannus*).

One female.

The description of this species ought to have been included in a previous part of this series, but was accidentally overlooked when the manuscript was sent to the editor.

Genus Dichætomyia, Malloch.

In describing this genus I placed particular emphasis upon the number of postsutural dorso-central bristles, and, in fact, used this character as the basis for the generic name. I find, however, that this is not a constant character, though there are very few exceptions to the rule in the series of the genotype species before me, only one specimen having three strong bristles, the others having either two strong bristles only or two strong and two very weak bristles behind the suture. I have arrived at the decision that other characters must be used to define the genus, and, in doing so, I have been forced to admit a large number of species from the African and Oriental regions which have always more than two strong postsutural dorso-centrals behind the suture.

The presence of hairs on the sides of the prosternum and on the pteropleura, some weak setulæ on base of third wing-vein on lower surface, and the forward curvature of the fourth vein apically distinguish the genus from its allies. The hind tibia has no calcar, but there are at times some short setulæ on the postero-dorsal surface. The hypopleura is either bare or there are some hairs near the lower posterior angle, and in a few cases there are some very short hairs on the latero-posterior declivous portion of the mesonotum in front of scutellum.

Dichætomyia polita, Malloch.

This species varies very strikingly in colour sometimes, being at times almost entirely glossy black, and in several examples before me yellowish testaceous with a distinctly vittate thorax and the apical half of abdomen blackened.

I have before me a good series taken at Obuasi, Ashanti (*Dr. W. M. Graham*).

Dichætomyia bifasciata (Stein).

Like all the species except the genotype this one was originally placed in *Mydæa* by its describer.

I have before me a male of this species which bears the written label "*Aricia bivittata*, Walker, MS.," and another label, presumably in the handwriting of Walker, with the name "*bivittata*."

Locality, New Guinea.

Dichætomyia niveipalpis (Stein).

A very distinct species, which is readily recognized, at least in the female, by the large, flattened, whitish palpi. The species has somewhat similar coloration to *bifasciata*, the thorax being brown vittate, but the abdomen is largely blackened on dorsum.

One specimen from Talum, Siam (*H. C. Robinson* and *N. Annandale*).

Dichætomyia fasciculigera (Stein).

I have before me four specimens from the Seychelles Islands, Sans Souci, 2. ii. 1906 (*P. R. Dupont*).

A yellow species without black thoracic vittæ and with black marks on dorsum of abdomen similar to those of the two preceding species.

Dichætomyia pectinipes (Stein).

I have seen one male from Peradeniya, Ceylon, which I am certain belongs to this species.

Dichætomyia apicalis (Stein).

One male from Cameroon, Africa, which I consider is undoubtedly referable to this species.

Dichætomyia distanti, sp. n.

Male and female.—Shining rufous yellow. Frons fuscous; antennæ yellow, third segment brownish apically; palpi yellow. Thorax indistinctly vittate, slightly whitish pruinescent. Abdomen with a large crescentic spot on apical half of third tergite and all of fourth tergite black. Legs yellow. Wings clear. Calyptræ and halteres yellow.

Male.—Eyes almost bare; head-structure normal. Thorax with 2+3 strong dorso-centrals; prealar short; anterior intra-alar long; scutellum bare below; prosternal and pteropleural hairs yellow. Basal sternite hairy. Fore tibia with a posterior bristle; mid-tibia with two posterior bristles; hind femur with two or three preapical antero-ventral bristles and some fine bristles on apical third of posteroventral surface. Fourth vein very slightly curved forward at apex.

Female.—Frons not over one-third of the head-width. Hind femur without fine bristles on apical part of posteroventral surface; hind tibia as in male, with one anterodorsal and one or two antero-ventral bristles and a posterodorsal setula at middle.

Length 7 mm.

Type, male, and allotype, Johannesburg, South Africa, vi. 1901 (*W. L. Distant*).

Dichætomyia fuscitibia (Stein).

The tarsi and usually a part of tibiæ in this species are blackened.

I have before me seven specimens from Obuasi, Ashanti (*Dr. W. M. Graham*).

Genus PAPUAIA, nov.

Generic characters.—Similar to *Dichætomyia*, differing in having the pteropleura bare, the hypopleura with some long hairs on upper margin in front of spiracle, metathoracic spiracle without setulose hairs overlying spiracular flap, and the prealar bristle absent. The anterior intra-alar bristle is absent in the only specimen I have before me.

Genotype, *Mydæa rufescens*, Stein.

The specimen bears labels similar to those borne by *Dichætomyia bifasciata*, Stein, but the name is *Aricia ochromyoides*, Walker, MS.

Genus SPILOPTEROMYIA, nov.

Generic characters.—Similar to *Papuaia*. Differs from it in having the hypopleura bare. Prosternum bare; pteropleura with some hairs in centre, scutellum with the hairs invading ventral surface from the sides; no hairs along lower margin of metathoracic spiracle; third wing-vein setulose at base below; anterior intra-alar and prealar present, but not strong; fourth vein distinctly bent forward at apex; hind tibia without postero-dorsal bristles, the apical dorsal bristle very short.

Genotype, *Spilogaster apicata*, Stein.

I have before me two specimens from Colombia, South America (*Dr. A. Balfour*).

In order to make clear the distinctions between the three genera just dealt with, I append a synopsis of the characters for their separation. All have the pteropleura hairy in part:—

1.	Prosternum with hairs on sides; metathoracic spiracle with setulose hairs along lower margin and overlying the spiracular flap	*Dichætomyia*, Malloch.
	Prosternum bare; metathoracic spiracle without setulose overlying hairs	2.
2.	Hypopleura with hairs on upper margin in front of spiracle; scutellum without hairs on sides	*Papuaia*, gen. nov.
	Hypopleura bare; scutellum with hairs on sides which invade ventral surface laterally	*Spilopteromyia*, gen. nov.

Limnophora spreta, sp. n.

Male.—Black, slightly shining, with dense whitish pruinescent markings on thorax and abdomen. Thorax with three contiguous black vittæ in front of suture, the usual spaces between the vittæ brownish, the area laterad of the vittæ and a small transverse spot in front of suture on each side of median line whitish pruinescent; vittæ behind suture contiguous on anterior half or more, a patch of whitish pruinescence on each side of median vitta just in front of scutellum; pleura largely whitish pruinescent, margins of sclerites blackish; scutellum whitish on margins apically. Second and third abdominal tergites each with a pair of large subtriangular black spots, which are narrowly separated centrally and extend from anterior to posterior margins; fourth tergite with a large subquadrate black central spot and a less distinct brownish spot on each side. Legs black. Wings brownish. Calyptræ and halteres yellowish.

Eyes at narrowest part of frons separated by about width of anterior ocellus; parafacial very narrow; longest hairs on arista longer than width of third antennal segment. Anterior two pairs of postsutural dorso-centrals weak. Bristles on posterior margins of second, third, and fourth tergites, and median bristles on fourth strong; basal sternite with a few hairs. Fore tibia unarmed at middle; mid-femur with some long fine hairs on basal half of postero-ventral surface; mid-tibia with a posterior bristle; hind femur with some fine hairs on basal half and four or five long bristles on apical half of antero-ventral surface, the basal half of postero-ventral surface with some bristles; hind tibia with one antero-dorsal and one antero-ventral bristle. Fourth vein distinctly curved forward apically.

Female.—Differs from the male in having the opaque black frons about one-third of the head-width, the thoracic vittæ more brownish, and the dorsal spots on abdomen larger.

Length 6–7 mm.

Type, male, allotype, and one male paratype. Theresopolis, Brazil, ix. 1887.

I believe this is the species recorded from Brazil by Stein as *corvina*, van der Wulp. I have before me a paratype of van der Wulp's species and it has the arista much shorter-haired, the abdomen differently marked, and the wings hyaline.

Genus EMMESINA, nov.

Generic characters.—Most closely related to *Mydæa*, the third wing-vein bristly at base, prosternum bare, and hind tibial calcar lacking, but the eyes of the female are not more widely separated than are those of the male, the genital segments of that sex are not spinose, the fifth sternite of the male is almost transverse at apex, the prealar bristle is absent, the third vein is slightly curved forward apically, and the arista is subnude.

Genotype, the following species.

Emmesina annandalei, sp. n.

Male and *female*.—Blackish brown, slightly shining, grey pruinescent. Antennæ and palpi black. Thorax with three contiguous brown vittæ, the dorsum appearing almost entirely brown. Abdomen dark brown, with a wedge-shaped grey pruinescent area on each side of each tergite at anterior margin. Legs pitchy black. Wings faintly brownish. Calyptræ and halteres yellow.

Male.—Eyes bare, facets larger in front; frons narrow, but about twice as wide as width across posterior ocelli; interfrontalia distinct on entire length; orbits uniform in width, with fine bristles on their entire length, a pair in line with anterior ocellus directed forward; parafacial linear; cheek about as high as width of third antennal segment, the latter about 2·5 as long as second; arista swollen at base. Thorax without strong presutural acrostichals, and with four pairs of postsutural dorso-centrals, the anterior two pairs weak; both intra-alars weak, the anterior one conspicuously so. Abdomen elongate-ovate; hypopygium small. Fore tibia with one posterior bristle; mid-tibia with two posterior bristles; hind femur with about seven fine bristles on antero-ventral surface, postero-ventral surface bare; hind tibia with one antero-dorsal and antero-ventral bristle.

Female.—Similar to male, the genitalia normal.

Length 4·5–5 mm.

Type, male, allotype and one male paratype, Bukit Besar, Siam (*H. C. Robinson* and *N. Annandale*).

Subfamily ANTHOMYIINÆ.

Pegomyia magna, sp. n.

Female.—Black, slightly shining, densely grey pruinescent. Antennæ and palpi black, apex of second segment of former reddish: frons black. Thorax when seen from behind with two broad fuscous vittæ laterad of the dorsocentrals, a narrow brown central vitta, and a faint dark line along the bases of the dorso-centrals. Abdomen checkered, with a dark dorso-central vitta which is visible from almost any angle. Legs yellow, tarsi black. Wings clear, veins yellow basally. Calyptræ and halteres yellow.

Frons slightly less than one-third of the head-width; orbits each with three supraorbital bristles and two infra-orbitals; cruciate interfrontals lacking: parafacial at base of antennæ wider than the rather broad third antennal segment; longest hairs on arista distinctly longer than width of third antennal segment; palpi narrow. Thorax with about three pairs of closely placed presutural acrostichals; prealar very long; sternopleurals 1:2. Fore tibia with one anterodorsal and one posterior bristle well apicad of middle; basal segment of fore tarsus slender, as long as next three, second, third, and fourth segments dilated, of about equal width, fourth less than twice as long as wide; mid-femur with two anterior, one antero-ventral, and three postero-ventral bristles basad of middle; mid-tibia with one antero-dorsal, one postero-dorsal, and two posterior bristles; hind femur with six antero-ventral bristles, a wide space between third and fourth, and one or two postero-ventral bristles; hind tibia with one antero-ventral, two antero-dorsal, and two postero-dorsal bristles. Costal thorn short; last section of fourth vein not longer than preceding section.

Length 11 mm.

Type, Lower Ranges, North Khasi Hills, Assam, 1878 (*A. Chennell*).

One female.

The largest species of the genus known to me.

XLI.—*Notes on Australasian Rats, with a Selection of Lectotypes of Australasian* Muridæ. By OLDFIELD THOMAS.

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WHILE determining a rat from Mt. Compass, in the neighbourhood of Adelaide, sent to the British Museum by Prof. Wood Jones, I have had occasion to study the various South-Australian species described by Grey and Gould, which were largely based on the material sent home by Capt. (later Sir) George Grey.

These specimens have been somewhat indiscriminately labelled *Mus* (now to be called *Rattus*) *fuscipes* and *greyi*, not to mention the larger forms related to *R. lutreola*. But examination shows that no S.-Australian specimens are really referable to *fuscipes*, which seems quite peculiar to Western Australia.

The S.-Australian series, however, is none the less divisible into two, one, the true *R. greyi*, of which I now designate no. 41. 1266, one of the co-types, skin and imperfect skull, as the lectotype, being the form sent home by Prof. Wood Jones, so that this native rat at least is still existent.

It is the smaller of the two species, the molars are decidedly smaller, the supraorbital edges are not ridged, even posteriorly, and, externally, the fur, though long, is not so excessively long as it is in the other species.

At least eight of the Museum specimens are referable to *greyi*, all received in 1841–1845, Prof. Wood Jones's example being the first additional specimen that has come home.

The other South-Australian species belongs to a type of rat widely distributed in the interior from Adelaide to North Queensland, in which latter region it has received the name of *culmorum*. It would appear to be divisible geographically into three forms, from Queensland, Interior New South Wales, and South Australia respectively. The three are alike in most essential characters, but there is a progressive increase southward in the softness and length of the hair, and a decrease in the size of the bullæ; the more southern forms also have greyer bellies and shorter feet.

Rattus culmorum vallesius, subsp. n.

General characters of true *culmorum*, but the fur thicker and softer; hairs of back about 15 mm. in length. Colour above very much the same, but below the belly is much greyer, the hairs slaty for most of their length, while in *culmorum* they are either wholly whitish or else merely have their extreme base greyish. Feet rather shorter than in *culmorum*.

Skull essentially similar to that of *culmorum*, but the tooth-row is shorter and the bullæ rather smaller.

Dimensions of the type:—

Head and body (on skin) 160 mm.; tail (as recorded by Sir T. L. Mitchell) 140; hind foot 28; ear 19.

Skull: greatest length 36·5; condylo-incisive length 35·2; zygomatic breadth 20; nasals 13·5; interorbital breadth 5; palatal foramina 7·5; bulla 8·3; upper molar series 6·6.

Hab. Interior of New South Wales. Type from Duck Creek, Macquarie River, Upper Darling; 31° 10′ S., 147° 40′ E. A skull in the Gould collection from the Darling Downs.

Type. Adult male. B.M. no. 47. 8. 14. 5. Collected on February 7th, 1846, during Sir T. L. Mitchell's 1845–46 expedition into Tropical Australia. Two specimens.

"Ooba" of the natives.—*Sir T. L. Mitchell.*

Rattus culmorum austrinus, subsp. n.

Fur again still longer than in *vallesius*, the hairs of the back commonly 20 mm. in length, while the longer piles overtop them by some 10 mm. General colour rather greyer and less definitely fawn-coloured. Below equally grey, as distinguished from the whitish of *culmorum*.

Skull with teeth as in *vallesius*, but the bullæ are still smaller.

Dimensions of the type:—

Head and body (skin) 155 mm.; tail 120; hind foot 28.

Skull: condylo-incisive length (c.) 34; back of parietals to gnathion 32·5; zygomatic breadth 18; nasals 13; interorbital breadth 4·5; palatal foramina 7·5; bulla 7·4; upper molar series 6·8.

Hab. South Australia; type probably from Kangaroo Island *.

Type. Adult male. B.M. no. 55. 12. 24. 336. Collected by Dr. J. B. Harvey and presented by him in 1841 to the Zoological Society's Museum. Five further specimens presented by Sir George Grey, and one (a lectoparatype of *R. greyi*) in the Gould collection.

Evidently a common rat in South Australia in the forties, but whether it still exists in any out-of-the-way part of the colony we have no evidence to show.

All the forms of *culmorum* are readily distinguishable from *greyi* by their distinctly beaded supraorbital edges, their larger teeth, and much larger bullæ.

Allied in a general way to *culmorum* is the following new species from Melville Island, North Australia:—

Rattus melvilleus, sp. n.

Most like *R. tunneyi* of the mainland of North Australia, but considerably larger.

Fur coarse and harsh, liberally mixed with flattened semispinous hairs; hairs of back about 13 mm. in length. General colour more strongly ochraceous than in the allied species; an indistinct ochraceous-buff line edging the upper colour, this line particularly noticeable along the cheeks and sides of the neck. Under surface dull buffy whitish, the hairs mostly whitish to their bases. Ears almost naked, their fine hairs white. Hands and feet white. Tail very thinly haired, brown above, slightly lighter below. Mammæ normally 2—3=10 as usual, but on one side of one female there appears to be an additional pectoral mamma.

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* I am informed by the authorities of the Zoological Society that Dr. Harvey's address in 1839 was Kingscote, Kangaroo Island, while it was Port Lincoln in 1842. As the specimen was sent to the Zoological Society's Museum in 1841, it is probable that it was obtained at or near the former place.

Skull like that of *R. tunneyi*, but considerably larger, more strongly built, and more heavily ridged. Palatal foramina surpassing the first third of m^1. Bullæ very large.

Dimensions of the type (measured in flesh):—

Head and body 173 mm.; tail 135; hind foot 30; ear 19.

Skull: greatest length 40; condylo-incisive length 39·4; zygomatic breadth 21·8; nasals 15 × 5·2; interorbital breadth 5·8; breadth across parietal ridges 15; palatal foramina 9·2; bulla 10·2; upper molar series 7·5.

Hab. Melville Island, off the Northern Territory of South Australia; type from Biro, Apsley Strait.

Type. Adult male. B.M. no. 13. 6. 28. 33. Original number 14. Collected 27th November, 1911, by Mr. J. P. Rogers. Three specimens, of which one is not fully adult.

Readily distinguishable from all other members of the group by its large skull and large bullæ.

Rattus mondraineus, sp. n.

Nearly allied to *R. fuscipes* of Western Australia, with which it shares the general size, long loose fur, and brown colour. But, externally, the colour is greyer, the buffy subterminal rings on the hairs (which give the brown tone to *fuscipes*) being less developed, so that the blue-grey of the underfur is more perceptible. Under surface lighter, the ends of the hairs more whitish. Throat noticeably more whitish than rest of under surface. Hands and feet whitish above, without tinge of brown. Tail as in *fuscipes*, moderately haired, brown above and below.

Skull with the nasals of normal proportions, not so unusually narrowed behind as they are in *fuscipes*. Interorbital region broader, its edges squarish, not sharply angular, and not ridged. Palatal foramina of medium length, rather narrow. Bullæ rather small. Molars decidedly smaller than in *fuscipes*.

Dimensions of the type (taken on the skin):—

Head and body 160 mm.; tail 138; hind foot 30.

Skull: greatest length 37·5; condylo-incisive length 35·5; zygomatic breadth 18·5; nasals, length 13·7, breadth at half their length 3·8; interorbital breadth 5·2; breadth of brain-case 16·3; palatilar length 16·8; palatal foramina 7·2 × 2·2; upper molar series 6.

Hab. Mondrain Island, off Esperance, south coast of Western Australia.

Type. Old male. B.M. no. 7. 7. 18. 3. Collected 29th April, 1906, by J. T. Tunney. Presented by the Western Australian Museum, Perth. Two specimens.

This island rat is alone related to *R. fuscipes*, a species which, in spite of various references from other parts of the continent, I believe to be strictly confined to Western Australia. The new form, while very similar externally, may be readily distinguished by the cranial details above described.

This species and the true *R. greyi* of S. Australia are exceptions to the statement made by me* that all Australian members of *Rattus* have supraorbital ridges; but it is quite evident that they really are *Rattus*, and not *Pseudomys*.

Hydromys nauticus, sp. n.

Size rather small, about as in *H. beccarii.* General colour above dark greyish brown, near "hair-brown," the middle dorsal area more blackish, quite black on the forehead, crown, and nape. Sides greyer. Under surface drabby, the hairs pale slaty at base, with "pinkish buff" ends. Hands pale brownish. Feet almost naked, their fine hairs dull whitish. Tail, as usual in the northern forms of the genus, with nearly half of the short-haired portion white.

Skull about as in *H. beccarii*, with similarly broad heavy muzzle. Incisors very pale yellow in front. Molars rather small.

Dimensions of the type (measured in flesh):—

Head and body 265 mm.; tail 215, its white terminal portion 79; hind foot 50; ear 22.

Skull: greatest length 55; condylo-incisive length 52·5; zygomatic breadth 27; breadth of muzzle on premaxillo-maxillary suture 10·8; nasals 17 × 6·6; intertemporal breadth 6·8; breadth of brain-case 20; palatilar length 25; palatal foramina 6·1 × 3·7; upper molars 8·1; breadth of m^1 2·8.

Hab. Aru Islands; type from Dobo.

Type. Old female with worn teeth. B.M. no. 10. 3. 2. 14. Original number 758. Collected 8th April, 1909, by W. Stalker; presented by the New Guinea Expedition.

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* Ann. & Mag. Nat. Hist. (8) vi. p. 604 (1910).

"Caught on the fore-shore at night."—*W. S.*

This species differs from the Key-Island species, *H. beccarii*, by its much darker colour, especially below, that animal having the under surface of a buffy whitish. In fact, so far as colour is concerned, it more nearly resembles the N.-Australian species *H. caurinus* and the Melville-Island form next to be described.

Hydromys melicertes, sp. n.

Apparently a small island representative of *H. caurinus.*

Size and general appearance very much as in the geographically distant *H. nauticus.* Colour above rather greyer than hair-brown, the crown and median dorsal area not specially darker. Sides lighter grey. Under surface very pale grey, "pale olive-grey," the hairs pale grey for the greater part of their length, their tips faintly buffy. Hands and feet dark brown. Tail with the proportions of black and white as in *H. nauticus.*

Skull as in *H. nauticus,* except that the muzzle is more slender. Nasals narrow. Anteorbital foramina less high. These differences, however, may in part be due to age.

Incisors strongly orange in front. Molars small, about as in *nauticus,* much smaller than in *caurinus.*

Dimensions of the type (measured in flesh):—

Head and body 232 mm.; tail 206; hind foot 54; ear 20.

Skull: basilar suture to gnathion 40; zygomatic breadth 25; nasals 16·8 × 5·5; breadth of muzzle on premaxillo-maxillary suture 8·3; interorbital breadth 6·8; breadth of brain-case 19; height of anteorbital foramen 5·8; palatilar length 23·5; palatal foramina 5·8; upper molars 8·2; breadth of m^1 2·9.

Hab. Melville Island. Type from Biro, Apsley Straits.

Type. Young adult female, the teeth fully up, but little worn. B.M. no. 13.6.28.37. Original number 15*. Collected 9th December, 1911, by J. P. Rogers.

"Trapped near the mangroves, among which the natives say it lives."—*J. P. R.*

Although geographically so close to the N.-Australian *H. caurinus,* this animal is of the same small size as the more distant Aru-Island form, from which it differs by its unblackened head and fore back, its browner feet, and its more slender muzzle.

Conilurus melibius, sp. n.

Closely allied to *C. penicillatus*, but with shorter feet.

Size about as in *penicillatus.* Colour of body quite the same buffy grey, with a more strongly buffy patch on the occiput and nape, this coloration being common to both *penicillatus* and *hemileucurus.* Under surface dull whitish, the hairs white to their roots. Hands and feet white. Tail greyish, blackening distally to a point three-fourths of its length, then abruptly white for its terminal fourth, tufted as in the allied species.

Skull, as compared with that of *hemileucurus*, of which alone good specimens are available, smaller, more strongly bowed, with less concave interorbital, the supraorbital edges evenly divergent behind, while in *hemileucurus* the interorbital region is comparatively parallel-sided, evenly concave in front and behind. Palatal foramina to the middle third of m^1. Molars small, as in *penicillatus*, considerably smaller than those of *hemileucurus.*

Dimensions of the type (measured in flesh) :—

Head and body 154 mm.; tail 177; hind foot 37; ear 23.

Skull: greatest length 38·2; condylo-incisive length 35·4; zygomatic breadth 21; nasals 15 × 3·9; interorbital breadth 6·7; palatilar length 18; palatal foramina 9; upper molar series 7·3; breadth of m^1 2·3.

Hab. Melville Island, N. Australia; type from Biro, Apsley Straits.

Type. Adult female. B.M. no. 13. 6. 28. 36. Original number 3. Collected 9th October, 1911, by Mr. J. P. Rogers.

This species differs from *C. penicillatus*, with which it shares the comparatively small teeth, by its much shorter feet, that animal having the feet of the same length as in the larger-toothed *C. hemileucurus.* To this latter I now refer a good series from the S. Alligator River, collected in 1903 by J. T. Tunney, and hitherto referred to *C. penicillatus.* It is interesting to notice that in this series some specimens have broadly white-tipped tails, as in the type of *hemileucurus*, and others with this organ wholly black, as in the original *penicillatus.*

The inconvenience and confusion that is always liable to arise from species being represented by a number of co-types (as exemplified by the presence of both *R. c. austrinus* and *R. greyi* among the co-types of the latter form) have made me think it advisable to draw up the following list of lectotypes of such Australian Muridæ as were described on two or more co-types. This was commonly the case with many of Gray's and Gould's species, and the reduction to a single specimen of each for use as a type will certainly tend to the simplification of future work on the group.

These lectotypes have been carefully selected after comparison with the original descriptions and with the fine figures given by Gould.

In one or two cases the same specimens have already been selected by me in previous papers, but it seems advisable, for the sake of completeness, to repeat the selection here.

Genus HYDROMYS.

H. fulvolavatus, Gould.	Lectotype ♂. 56. 10. 28. 14. Murray R., S. Australia. J. Gould.
fuliginosus, Gould.	♀. 56. 10. 28. 15. K. George's Sound, W.A. (*J. Gilbert*). Gould Coll.

Genus UROMYS.

U. cervinipes, Gould.	♀. 52. 12. 15. 1. Stradbrook Isld., (*F. Strange*). Gould Coll.
rufescens, Alst	♀. 77. 7. 18. 27. Duke of York Isld. Rev. G. Brown.

Genus RATTUS.

R. assimilis, Gould.	♂. 58. 11. 24. 10. Clarence R., N.S.W. (*F. Strange*). Gould Coll.
browni, Alst.	♀. 77. 7. 18. 26. Duke of York Isld Rev. G. Brown.
greyi, Gray.	♂. 41. 1266. S. Australia. Gould Coll.
leucopus, Gray.	♀. 67. 5. 6. 4. Cape York (*Damon*). Higgins.
lutreola, Gray.	♂. 41. 1258. Mosquito Isld., Hunter R., N.S.W. Gould Coll.
sordidus, Gould.	♂. 58. 11. 24. 6. Darling Downs, N.S.W. Gould Coll.
vellerosus, Gray.	♂. 47. 3. 1. 2. S. Australia. Sir G. Grey.
velutinus, Thos.	♀. 77. 7. 3. 1. Tasmania. A. Simson.

Genus PSEUDOMYS.

Ps. albocinereus, Gould	44. 7. 9. 16. Perth, W.A. (*J. Gilbert*). Gould Coll.
delicatulus, Gould.	42. 5. 26. 17. Port Essington (*J. Gilbert*). Gould Coll.
gouldi, Waterh.	♀. 55. 12. 24. 149. Hunter R., N.S.W. (*Gould*). Zool Soc. Mus.
lineolatus, Gould.	58. 11. 24. 4. Darling Downs, N.S.W. Gould Coll.
nanus, Gould.	44. 9. 30. 10. Victoria Plains, W.A. (*J. Gilbert*). Gould Coll.
novæhollandiæ, Waterh.	43. 2. 24. 1. N.S.W. Gould Coll.

	Genus Leporillus.	
L. apicalis, Gould*.	♀.	53. 10. 22. 15. S. Australia (*F. Strange*). Gould Coll.
	Genus Notomys.	
N. cervinus, Gould.		53. 10. 22. 7. 29° 6′ S., 141° E. (*Sturt*). Gould Coll.
gouldi, Gould.		7. 1. 1. 135. W. Australia (*J. Gilbert*). Tomes Coll.
longicaudatus, Gould.		44. 7. 9. 15. Moore's R., W.A. (*J. Gilbert*). Gould Coll.
	Genus Conilurus.	
C. constructor, Og.	♀.	63. 2. 20. 1. N.S.W. (*G. Caley*). Linnean Society.

XLII.—*On Specimens of* Cephalodiscus densus *dredged by the 'Challenger' in 1874 at Kerguelen Island.* By W. G. Ridewood.

[Plate XII.]

The genus *Cephalodiscus* was founded upon material dredged by the 'Challenger' in January 1876 from Station 311 in the Straits of Magellan; the material was described in 1887 by M'Intosh and Harmer in the Reports of the 'Challenger' Expedition (12), but preliminary accounts were published in 1882, 1883, and 1885 (10, 11, 8). For many years this material of *Cephalodiscus dodecalophus* remained the sole representative of the genus, and it was not until 1903 that Andersson (1) announced a rediscovery of *Cephalodiscus* by the Swedish South-Polar Expedition, and Harmer (5) notified the securing of new species of the genus by the 'Siboga' Expedition. Since that year numerous species have been founded upon material obtained by the 'Siboga' Expedition (6), by Dr. Gilchrist (13), by the 'Discovery' Expedition (9, 14), by the Swedish South-Polar Expedition (2), by Dr. Schepotieff (19), by the Second French Antarctic Expedition (3, 4), by the Scottish National Antarctic Expedition (7), and by the British Antarctic ('Terra Nova') Expedition (16).

Up to the present time sixteen species of *Cephalodiscus* have been described, but some of the specific names may have to be regarded as synonyms (see 16, p. 14, footnote). A synopsis of all the species of *Cephalodiscus* at present known is given on pages 66–77 of the 'Terra Nova' Report (16), together with a list of all recorded specimens and details of the localities from which they were severally obtained. A key for the ready identification of the various species was published last year in the 'Annals and Magazine of Natural History' (18).

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* The Museum received from Gould two specimens of this animal, though he stated that he had only one. It seems, therefore, advisable to nominate the specimen that best fits the description as the lectotype.

The first-recorded specimens of *Cephalodiscus densus* were obtained on the Swedish South-Polar Expedition of 1901–1903, and were described by Andersson in 1907 (2); other specimens have since been secured on the British Antarctic ('Terra Nova') Expedition of 1910–1913 (16), and on the Australasian Antarctic Expedition of 1911–1914 (17). It is of particular interest now to be able to record the dredging of material of this species as far back as 1874—that is to say, two years before the classical material of *Cephalodiscus dodecalophus* was obtained. While, however, the specimens that form the subject of the present communication must be admitted to be of exceptional interest, by reason of the fact that they were obtained earlier than those of *Cephalodiscus dodecalophus*, they nevertheless do not constitute the first specimens of *Cephalodiscus* dredged, for it is almost certain that material of *Cephalodiscus nigrescens* was obtained on the 'Erebus' and 'Terror' Antarctic Expedition in either 1841 or 1842 (15).

Previously recorded material of *Cephalodiscus densus* shows that the species has a wide distribution in the Antarctic seas, specimens having been obtained in Ross Sea by the 'Terra Nova' Expedition, off Graham Land by the Swedish South-Polar Expedition, and off Queen Mary Land by the Australasian Antarctic Expedition. It is interesting to be able now to add to these a fourth locality—Kerguelen Island. Should Gravier's species *Cephalodiscus anderssoni* prove to be the same as Andersson's *Cephalodiscus densus*, the known distribution of the species is not thereby greatly extended, for the localities from which Gravier's material and Andersson's material were obtained are on the west coast and east coast of Graham Land respectively—see map, pl. vi. in 'Terra Nova' Report (16).

The material now under consideration is contained in tw bottles, and, though all was obtained from the same locality— Kerguelen Island, Stat. 149, January 1874,—the subsequ histories of the two parts of it prove to have been differe The larger bottle contains seven fragments, four of wh might have come from the same colony; these are of a sa grey colour. The other three pieces are of a rather rufous tint; they are "dead," with no zooids in the tu and the common cœnœcial substance between the tubes partly perished, so that the tubes readily separate from one another. Photographs of the two best pieces of the grey material are reproduced in Pl. XII. The largest piece (B) is viewed from the internal or torn surface, *i. e.*, the surface by which it was connected with the rest of the colony; on the external or natural surface the tubes are shorter. The upper photograph (A) is a top view of a smaller piece, having shorter tubes.

The material in this, the larger bottle, was in the first instance sent from Edinburgh, where the distribution of the 'Challenger' material took place, to Mr. S. O. Ridley, to whom was entrusted the writing of the report upon the Monaxonid sponges of the expedition. The original 'Challenger' label, still on the bottle, reads:—"Sponge; 17 Jan. 1874; Royal Sound, Kerguelen Island, 25 fms." Inside the bottle is a parchment label giving the same particulars, although the "Jan." of the date looks like "Jun.," and might be taken to stand for "June"; even in the external label the month of the date looks like "Jane." The 'Challenger,' however, was not at Kerguelen Island in June, but in January. There is, further, a small parchment label bearing the words "Chall. 159, Royal Sound, Kerguelen, 25 faths." But Station 159 is between Termination Land and Melbourne, with date March 10th, 1874, and depth 2150 fath.—so that there is evidently here a clerical error, the 159 being a mistake for 149, which is the Kerguelen Island Station. According to the "Summary of Results," part 1, p. 460, the 'Challenger' was off Kerguelen Island from January 9th to January 29th, 1874, and "a great many soundings, dredgings, and trawlings were taken . . . in depths varying between 20 and 150 fathoms."

This bottle of material was sent back by Mr. Ridley on June 4th, 1883, marked "Hydroid?." When the part of the 'Challenger' Collection known as the "Supplementary Collection" was despatched from Edinburgh to the British Museum (Nat. Hist.) in 1890, the material referred to was registered as 90. 4. 11. 13—*i. e.*, the thirteenth specimen registered on April 11th, 1890. It was still regarded as a kind of Hydrozoan allied to *Spongicola fistularis*, and remained among the Hydrozoa until it was recognized by Mr. R. Kirkpatrick in February 1919 as a form of *Cephalodiscus*. Mr. Kirkpatrick reported his discovery to the Director of the Museum, Sir Sidney Harmer, who, in July 1921, was good enough to hand the bottle over to me for a description of the contents.

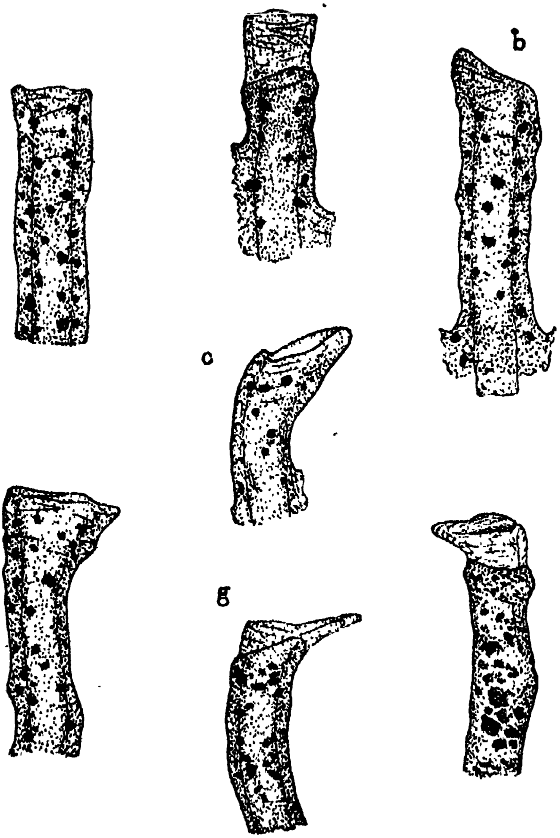
A few days afterwards, by a strange coincidence, Sir Sidney Harmer submitted to me the second bottle, which had just been received from Prof. W. C. M'Intosh in a collection of specimens taken over from him by the Museum. In the letter that accompanied the collection Prof. M'Intosh writes:—"There are also some annelids, a few of which require working up, a *Cephalodiscus*? from Kerguelen, and sundry other things." The original 'Challenger' label on the bottle bears the words "Kerguelen, 20–60 fms." in ink, and in pencil, in Prof. M'Intosh's handwriting, "*Cephalodiscus*? and a curious Polyzoan." The Polyzoan, which is attached to the cœnœcial tubes of the *Cephalodiscus*, is, I am informed by Sir Sidney Harmer, probably *Beania magellanica*.

This second bottle has a capacity of 70 c.c. only, and the eight fragments that it contains are all small. Judging from the difference in the records of the depth—20–60 fath. on this bottle, and 25 fath. on the larger bottle—it would seem that the two lots of material did not come up in the same dredging; indeed, it is possible that they were not obtained on the same day, for the 'Challenger' remained off Kerguelen Island for three weeks.

Of the two best pieces in the larger bottle, shown on Pl. XII., the larger (B) measures about 57×44×30 mm. The cœnœcial tubes vary from 20 to 45 mm. in length, and have a uniform internal diameter of 1·0 mm. The external diameter of the upper parts of the tubes that stand out freely, and are not connected by common cœnœcial substance, is 1·6 or 1·7 mm. Some of the tubes are bulbous at their lower, blind ends, the greatest diameter observed in a bulb being 1·4 mm. The long tubes show a few concavo-convex septa, irregularly disposed, but confined mainly to the lower ends. The extent to which the free part of a tube stands out from the common cœnœcial substance varies considerably, mostly within the limits of 10 and 30 mm. Sand-grains occur embedded in the walls of the tubes and in the common cœnœcial substance.

The upper ends of the tubes differ from those of *Cephalodiscus densus* dredged by the 'Terra Nova' in occasionally showing a lateral lip. The majority of the tubes resemble those represented in the accompanying text-figure, a and b, and have the terminal ostium transverse or oblique, without any marked lateral extension; in this respect they resemble the tubes of the 'Terra Nova' material (16, p. 42, text-fig. 4), although there is a larger proportion of strongly oblique ostia than in the latter. But some of the tubes have a laterally extended ostium (text-fig., c), or a tongue-shaped lateral process (g), or even a funnel-shaped ostium (d). A peculiar feature, represented in the text-figure, e, f, g, suggests that in some of the tubes there has been a cessation and subsequent resumption of growth, for the more terminal parts are paler and more transparent than the rest, with a sharp line of demarcation between the two.

In the 'Terra Nova' material of *Cephalodiscus densus* some groups of tubes were found to be flanged externally (16, p. 41,



Cephalodiscus densus from Kerguelen Island.
Upper ends of cœnœcial tubes, about × 6.

and pl. v. fig. 6), and an explanation of the origin of the flange may be afforded by the occurrence of infundibuliform ostia such as here shewn in the text-fig., d. If the growth of such a tube were resumed, and the new part were narrow, like that shown in the text-fig., e, the margin of the funnel would then appear as an external flange set at some distance below the upper end of the tube.

The other specimen figured (Pl. XII., A) measures about 28 × 44 × 30 mm. None of the tubes are more than 20 mm. in length, and the ostia are almost all transverse, like those shown in the text-fig., a.

The zooids agree in size with those of *Cephalodiscus densus* described in the 'Terra Nova' report (16). In the table below, the first numeral represents the length in millimetres from the tips of the arms to the cæcal end of the body—that is to say, the total length of the body, not counting the stalk; the second stands for the length from the bases of the arms—*i. e.*, the anal region of the body—to the cæcal end; the third is the average width of the body. The constancy in the third measurement is evidently associated with the uniformity in the internal diameter of the cœnœcial tubes from which the zooids were extracted:—

5·8	3·4	0·9	5·2	3·6	0·9
5·7	4·1	0·9	4·8	3·0	0·9
5·6	4·0	0·9	4·6	3·0	0·9

There is no reason to suppose that anything but alcohol was employed for the preservation of the material, and considering that, except for an occasional inspection, the specimens have been untouched for nearly fifty years, the condition of the zooids is remarkably good. For general purposes alcohol still remains one of our most satisfactory preservative fluids; in the 'Terra Nova' material of *Cephalodiscus densus* it was noted that the zooids were in a better state of fixation in the alcohol-preserved material than in that preserved in formalin solution (16, p. 47).

In colour the zooids are ochreous, but if removed from the tubes and kept in alcohol in the light they become darker and assume a greenish-brown tint. Four selected zooids were cut into serial sections, but they present no new features. The notochord measures from 0·24 to 0·29 mm. in length and from 0·02 to 0·03 mm. in sagittal diameter; the cavity of the basal part is discontinuous, there being four or five irregular partitions.

The arms are in most cases sixteen, but two zooids were found to have seventeen, two eighteen, and one nineteen. In two of the zooids examined one of the marginal arms, next to the edge of the oral lamella, was a diminutive, arrested arm with not more than ten or twelve pairs of tentacles (*cf.* 16, p. 45, text-fig. 6, H). The tentacles in a fully-developed arm consist of forty to fifty pairs.

In the tubes of the piece of colony shown in Pl. XII., B, there occur three kinds of zooids—those with two ovaries, those with two testes, and those with an ovary and a testis. The gonads vary in their state of maturity in different zooids. The young ovaries are rather longer and straighter than those figured as C and D in text-fig. 7 of the 'Terra Nova' Report (16, p. 46), and the pigment-granules around the oviducal aperture are black rather than red. In the material in the smaller bottle, received from Prof. M'Intosh, all the zooids that were examined had ripe gonads. Free ova occur in this material; they are found among the buds, in the deeper end of the cœnœcial tube, there being not more than one ovum in any one tube. The ova are free, and not attached by a stalk; they measure 0·9 mm. in length and 0·6 mm. in width, and the two ends are similar. In two cases where a free ovum was present in the cœnœcial tube among the tangle of buds it was found that the zooid inhabiting the tube was hermaphrodite, and the ovary and testis were both ripe (*cf.* 16, p. 47, and 17, p. 23). It would be interesting to ascertain if a free ovum ever occurs in a tube inhabited by a male zooid—probably not; the present material is too limited in bulk to permit of a more extended search in this direction.

The greatest number of buds found attached to any one zooid is eighteen; this group includes buds of all stages of development, from the very young stage before the appearance of the red line of the shield up to a large bud with small tentacles appearing on the arms (*cf.* 16, p. 47, text-fig. 8, C and K). The youngest buds, however, are not buds of the main zooid, but arise from the side of the extremity of the stalk of a large bud—that is to say, the larger buds begin producing the next generation of buds before separating from the parent zooid. The largest bud of the group of eighteen just mentioned had two small buds of its own.

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EXPLANATION OF PLATE XII.

Photographs, of the natural size, of two specimens of *Cephalodiscus densus*, Andersson, dredged by the 'Challenger' in Royal Sound, Kerguelen Island, Jan. 17th, 1874, from a depth of 25 fath. A, top view; B, side view.

XLIII.—*The Jerboa of Muscat.* By Oldfield Thomas.

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While determining an example of *Jaculus loftusi* obtained near Baghdad by Major Cheesman, my attention has been drawn to the examples from Muscat presented by Dr. Jayakar and hitherto referred to the same species. But with six skulls of true *loftusi*, ranging from Karyatein (*Carruthers*) to Mohammorah (*Loftus*), before me, and three of the Muscat form, I find that there are certain cranial differences between the two and would suggest that the latter should be distinguished as

Jaculus loftusi vocator, subsp. n.

External characters quite as in *loftusi*, but, the specimens being or having been in spirit, the exact tone of colour cannot be observed.

Skull of about the same size as in *loftusi*. Anteorbital foramina smaller, of more equal breadth above and below, not expanded above as in *loftusi*; greatest breadth across the two foramina in four specimens of *loftusi* 15·8, 16·2, 15·2, and 15·4, in three specimens of *vocator* 14·2, 14·0, and 14·0. Front edge of zygomatic plate outside the foramina more vertical, nearly at right angles (88°, 89°) to the line of the tooth-row, while in *loftusi* it slants back considerably (75°, 76°). Interparietal smaller, averaging about 4·5 × 5·4 as compared with 5·5 × 7·0 mm. Other characters apparently quite as usual.

Dimensions of type, measured on the spirit-specimen:—

Head and body 95 mm.; tail 164; hind foot 57; ear 21.

Skull: greatest median length 29·7; greatest diagonal length to back of bullæ 32; greatest breadth across face 22·4; interorbital breadth 12; bimeatal breadth 23·2; anteorbital foramen, height 5·4, breadth across the two foramina 14·2; upper molar series 4·8.

Hab. Coast region near Muscat; type from Sohar, others from Seeb.

Type. Adult male in spirit. B.M. no. 0. 5. 22. 3. Presented by Dr. A. S. G. Jayakar.

Although the two co-types of *loftusi* (of which 55. 1. 6. 82 may now be formally selected as a lectotype) have the zygomatic plate broken away, enough remains to show that the anteorbital foramina are of quite the same shape as in our series from Karyatein.

XLIV.—*A new Short-tailed Opossum from Brazil.*

By Oldfield Thomas.

(Published by permission of the Trustees of the British Museum.)

Monodelphis theresa, sp. n.

Most nearly allied to *M. iheringi*.

Size about as in *iheringi*; fur similarly short and close, hairs of back about 4 mm. in length. Coloration on the same general plan, but the ground-colour is dark grizzled grey, which, however, is only present on the anterior two-thirds of the body, the head and rump deep chestnut-rufous. Dorsal lines almost obsolete, the median one represented by segments of a few millimetres on the nose and nape and an ill-defined line on the posterior back ending level with the hips; the outer lines only about an inch in length, ill-defined and scarcely perceptible. Under surface soiled greyish, the ends of the hairs drabby white. Cheeks, like crown, rich rufous; chin pale rufous. Hands brown. Feet with the outer side of the metatarsus brown, inner dull whitish; digits naked. Tail brown above, lighter below.

Skull not so flattened as in *iheringi*, more of the general shape of that of *americana*, the brain-case comparatively high and rounded.

Dimensions of the type (measured on a spirit-specimen):—

Head and body 80 mm.; tail 36; hind foot 14; ear 10.

Skull: greatest length 25·2; condylo-basal length 25; zygomatic breadth 13·5; nasals 10×3·8; interorbital breadth 5·4; palatal length 14·5; maxillary tooth-row 10·7; three anterior molariform teeth 4·6.

Hab. Theresopolis, Organ Mts., Brazil.

Type. Adult female. B.M. no. 21. 8. 6. 2. Received in exchange from Prof. J. P. Hill.

This pretty little species is readily distinguishable from *M. iheringi* by its rufous head and rump, its greyish fore-back, and its obsolescent dark dorsal lines.

XLV.—*A new Cotton-tail* (Sylvilagus) *from Colombia.*

By Oldfield Thomas.

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The British Museum owes to Frère Nicéforo Maria of Medellin an example of a fine *Sylvilagus* which seems to be different from any described species. It may be called

Sylvilagus nicefori, sp. n.

A member of the short-eared group, the tail almost obsolete.

Fur fairly soft, hairs of back about 23–25 mm. in length.

General colour dark, mixed buffy and blackish, the buffy comparatively pale, not strong and ochraceous. Sides paler buffy. Under surface dull whitish anteriorly, dull buffy posteriorly, the hairs slaty at base. Forehead and nape buffy ochraceous, the nape-patch extending beyond the ends of the short ears. Proectote blackish, slightly suffused with buffy; metentote dull whitish, its edges inconspicuously buffy. Sides of head grizzled greyish, very slightly suffused with buffy. Chin dull whitish, interramia white. Neck-band broad, the ends of the hairs deep buffy, the underfur dark slaty blackish. Front of fore limbs and upper side of feet ochraceous, inner side of thighs buffy, not white as in *apollinaris*. Tail almost obsolete, its situation marked by a small tuft of brownish hair amid the buffy of the rump.

Skull about as large as that of *S. purgatus*, larger and, especially, broader than that of *S. salentus*. Interorbital region flat, parallel-sided, not broadened anteriorly. Postorbital processes well developed, slender. Bullæ small.

Dimensions of the type (measured on skin):—

Head and body 420 mm.; tail about 5; hind foot 76; ear 45.

Skull: greatest length 75; condylo-incisive length 68; zygomatic breadth 36·5; nasals, oblique length 31·5, greatest breadth 16·3; interorbital breadth 16; intertemporal breadth 12; palatal foramina, length 18·7, breadth 7; breadth of palate between anterior premolars 11·3; cheek-tooth series (alveoli) 14·5.

Hab. Medellin. Type from San Pedro, another specimen from Concordia (*J. K. Salmon*).

Type. Adult male. B.M. no. 21. 7. 1. 26. Original number 12. Collected December 1919. Received in exchange from Frère Nicéforo Maria.

This *Sylvilagus* is nearly allied to *S. apollinaris* of Bogotà, but is duller-coloured, with less prominently white under surface, especially posteriorly. From *S. salentus*, Allen, of which Mr. Anthony has kindly furnished me with some additional details, it is distinguished by its broader nasals and interorbital region, and its even shorter tail.

XLVI.—*On a new Willow-Titmouse from Northern Italy.*

By PERCY R. LOWE, M.B.O.U., F.Z.S.

IN July last, during a short visit to the Valtournanche Valley in Northern Italy, I shot six willow-tits one morning on a steep forest-grown slope at an elevation of 7000 feet, and was struck by their peculiar and very dark appearance. Two of the birds were fully adult and much worn, while the remaining four were birds of the year in fresh plumage; but both young and adults exhibited the same striking dark coloration.

On comparing them with our series of the *Pœcile atricapillus* group in the British Museum, I could find nothing like them, nor, as Dr. Hartert informed me, had they anything comparable in the fine series at Tring.

I propose, therefore, to distinguish this new form by the name of

Pœcile atricapillus elenæ, subsp. n.

Adult. Differs from *P. a. montanus* in having the upper parts smoky grey washed with olive-brown—the top of the head and the nape pure dull black, as compared with brownish black,—the white cheek-patches more restricted, and the black of the throat extending further on to the breast (as in *P. a. atricapillus*).

The underparts are greyer and the flanks only very faintly washed with fawn.

Freshly moulted wing- and tail-feathers in the adults are dark slaty in coloration, darker than in *P. a. borealis* and very much darker than in *P. a. montanus*.

In the four "birds of the year" the general coloration is still darker, the contrast between young examples of *P. a. elenæ* and *P. a. borealis* being very striking and obvious indeed (mantle dark olive-grey, as contrasted with pale grey-brown).

Young *P. a. elenæ* are very noticeably darker even than young birds of the Japanese form *P. a. restrictus*, while, as an indication of their dark coloration, they are darker than *P. palustris pœcilopsis*, Sharpe.

Type in Brit. Mus. ♀ juv. Breuil, Valtournanche, N. Italy, 27. vii. 21. Coll. P. R. Lowe. Reg. Brit. Mus. 1921. 8. 2. 7.

I note little in the measurements as between *P. a. borealis* and *P. a. elenæ*.

In choosing a juvenile example as the type, I do so because it seemed to be possible to gain a more accurate perception of colour-differences in fresh-plumaged juveniles, and it is just as easy to compare juveniles with juveniles as adults with adults of various races.

XLVII.—*On new Forms of South-American Birds.*

By C. Chubb, M.B.O.U., F.Z.S.

Sturnella magna monticola, subsp. n.

Adult male. Differs from *S. magna meridionalis*, Sclater, and *S. magna paralios*, Bangs, in being chestnut-brown on the upper surface instead of blackish and the general measurements smaller.

Total length 230 mm., exposed culmen 32, wing 106, tail 70, tarsus 38, middle toe and claw 33.

Adult female. Similar to the adult male, but smaller. Wing 98 mm.

Hab. Mount Roraima, British Guiana.

The type, as also the female described, are both in the McConnell Collection, and were collected by Mr. McConnell at Mount Roraima during his expedition in Oct. 1898.

Sturnella magna praticola, subsp. n.

Adult male. Differs chiefly from *S. magna monticola* in its smaller size, brighter coloration on the under surface, and more white in the tail.

Total length 225 mm., exposed culmen 30, wing 101, tail 62, tarsus 38, middle toe and claw 33.

Adult female. Similar to the adult male, but smaller. Wing 93 mm.

Hab. Abary River, British Guiana.

The type and the female described are both in the McConnell Collection, and were collected on the Abary River in Sept. 1906.

Saltator cayanus interjector, subsp. n.

Adult male. Differs from *S. cayanus cayanus* in being paler grey on the sides of the face, sides of the neck, and sides of the body. It is darker, however, on these parts than *S. cayanus bolivianus.* "Bill bluish black; feet brown; iris dark blue" (*A. Robert*).

Total length 210 mm., exposed culmen 18, wing 96, tail 88, tarsus 26.

Adult female. Similar to the adult male. Wing 95 mm.

Hab. Matto Grosso, South Brazil.

The type, which is in the British Museum, was collected at Serra da Chapada (900 metres), Matto Grosso, in June 1902, by A. Robert, during the Percy Sladen Expedition to Brazil.

Saltator cayanus bolivianus, subsp. n.

Adult male. Differs from *S. cayanus cayanus* in being paler on the under surface, the lower throat cinnamon-buff instead of fawn-colour, the breast, sides of body, and thighs pale ash-grey instead of dark lead-grey, the abdomen cream-white instead of pale buff; the under tail-coverts and under wing-coverts are also much paler, and the white supraloral streak wider. "Bill black; feet slate-colour; iris dark brown" (*P. O. Simons*).

Total length 211 mm., exposed culmen 17, wing 103, tail 93, tarsus 25.

Adult female. Similar to the adult male. Wing 95 mm.

The type and female described, which are in the British Museum, were collected at Chulumani, Bolivia, 2000 metres, Jan. 1901, by P. O. Simons.

Hab. Bolivia.

Saltator cayanus santaritensis, subsp. n.

Adult male. Allied to *S. cayanus cayanus*, but differs in being paler in general coloration both on the upper and under surface, and differs from *S. cayanus bolivianus* in having the fawn-colour on the lower throat continued down the middle of the breast and middle of abdomen to the under tail-coverts.

Total length 217 mm., exposed culmen 17, wing 102, tail 99, tarsus 26.

Adult female. Similar to the adult male, but smaller. Wing 96 mm.

The type, which is also in the British Museum, was collected at Santa Rita, Ecuador, by "Villagomoz per" C. Buckley, Salvin-Godman Collection.

Hab. Santa Rita, Ecuador.

Piranga saira macconnelli, subsp. n.

Adult male. Differs from *P. saira saira* in having the general coloration paler. General colour of the upper surface orange-red, somewhat brighter on the top of the head and upper tail-coverts, darker on the back, wings, and tail; inner webs of upper wing-coverts and bastard-wing dark brown, darker and inclining to black on the inner webs of the flight-quills, which have the margins rose-pink; inner webs of tail-feathers reddish brown; entire under surface bright scarlet-red, including the under wing-coverts and axillaries; under surface of flight-quills hair-brown with rose-pink edges; lower aspect of tail similar to its upper surface.

Total length 182 mm., exposed culmen 18, wing 97, tail 75, tarsus 23.

Hab. British Guiana.

The type is in the McConnell Collection, and was collected in the Upper Tukutu Mountains, 1908.

Adult female. General colour of the upper surface dull yellow, tinged with green on the back; inner webs of flight-quills dark brown margined with pale yellow; sides of face, throat, and underparts bright yellow. Wing 90 mm.

The female described was collected by the late Henry

Whitely at Quongo, November 18, 1887, and is now in the British Museum.

Immature male. Similar to the adult in its first plumage. The first signs of the male plumage in the present bird are the approach of orange-red feathers on the sides of the face, throat, abdomen, under tail-coverts, and tail.

The young male described is in the McConnell Collection, and was collected in the Takutu Mountains.

BIBLIOGRAPHICAL NOTICE.

The Life of Alfred Newton. By A. F. R. Wollaston.

There must be few ornithologists of any standing within the British Empire who have not been waiting with what patience they might possess for a 'Life of Alfred Newton' to appear. And now, at last, after unavoidable delays, it has appeared, and Mr. A. F. R. Wollaston must be heartily congratulated on having drawn for us, out of the mass of facts and correspondence which it was his difficult task to sift and condense, a life-like sketch of the man as he was, and of the great influence which he exerted for the good of ornithology.

In his capacity as a Professor of Zoology in the University of Cambridge, Alfred Newton could never be said to have reached the high-water mark of academic fame; but as an English ornithologist he occupied an authoritative position which was not only somewhat peculiar, but which it is safe to say will never be surpassed for many a long day.

In the comparatively narrow circles of ornithology he made himself famous and ever memorable, first, by his 'Dictionary of Birds' and its masterly Introduction, probably one of the best things which has ever been written by an ornithologist; secondly, by his enormous correspondence and the unsparing, unselfish way in which he imparted his knowledge of birds, bird-lore, and bird-literature to those who sought his aid; thirdly, by his Sunday evening gatherings in his college rooms at Magdalen; and, fourthly, by his whimsicalities.

Newton did not suffer fools gladly, but once his friend you were always his friend. Like all notable men he had his little ways, his little peculiarities, and his little prejudices. It is probable that these only endeared him the more to those who really knew him. With his passing the curtain may be said to have been rung down upon a stage across which passed a school of leisured men who may be said to have revivified the study of ornithology in the British Isles, and also by their indefatigable and enthusiastic efforts laid a sure and solid foundation upon which their younger and no less enthusiastic followers of the more modern school are surely building worthily and well. Of the older school, Newton may be said to have been the inspiration and the doyen. Not only did he travel and collect and write about his discoveries, but he was probably the prime mover in the launching of the British Ornithologists' Union and its well-known quarterly journal 'The Ibis,' which may be said to have been conceived in his rooms at Cambridge. To the devoted band of ornithologists who put their heads together to launch that publication upon the world those must have been happy days. They were the spacious days of ornithological adventures, expeditions, and research in the open field; spacious days of discovery; days of the constant recording of new species as contrasted with subspecies; days of romance, when it was still possible to live buoyed up by the hope that one might discover the Great Auk alive and "in the flesh"; days when maps had still many vast spaces to be charted and foreign countries were veritable eldorados for the happy ornithologist eager to ransack them of their treasures.

Newton may, in a sense, be said to have been born and bred upon one of these happy hunting-grounds in the form of his father's estates at Elvedon, where he first acquired, with his brother Edward, his taste for ornithology. In those early days of the last century the great Bustard, though on the verge of extinction, still survived in the brecks of Norfolk—the last of the resident stock was killed in 1838,—and Montagu's Harrier might be fairly commonly met with in the fens of Cambridgeshire. In such an early environment there need be little wonder that the ornithological factor in Newton's mental complex soon developed. It led him, in spite of physical disabilities, further afield—to Norway, Lapland, Spitzbergen (when an expedition to that boreal region was in the nature of a considerable adventure), Iceland, the West Indies, the Orkneys, and Faroe Islands, and on many yachting excursions along the west coast of Scotland.

By the happy accident of his brother Edward's position at Mauritius he was led to study, through the acquisition of a fine collection of fossil bones, the extinct Dodos of the Mascarene Islands, and as a result we have his article on the Dodo in the 'Dictionary of Birds,' an exposition which "may be cited as an illustration of the learning and the exhaustive criticism with which he could discuss a matter which strongly appealed to him," to say nothing of the almost complete skeleton which is one of the cherished possessions of the Cambridge University Museum. It would be beyond the scope of these few remarks to dwell on the fact of how much that Museum owes to Newton's efforts. Indeed, we would rather recommend Mr. Wollaston's book for the admirable way in which he has been able to catch the spirit of the ornithological period through which Newton lived and worked, and to depict for us the very nature of the man as he was, than as a serious attempt to record in an exhaustive way his work as a zoologist.

The book cannot fail to fascinate any reader who has a soul above the mere systematic side of ornithology, and for whom the memory of such men as the Newtons, Tristram, the Godmans, Sclater, Wolley, Lilford, Gurney, Salvin, Taylor, Eyton, and a host of others of their time marks a very notable and a very happy period in the history of British ornithology. PERCY R. LOWE.

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XLVIII.—*Revision of the African Species of* Hedybius, *Er.*, *and its Allies, with an Account of their accessory ♂-characters* [*Coleoptera*]. By G. C. Champion, F.Z.S.

[Plates XIII. & XIV.]

This paper is based upon a study of the species of the Malachiid genera *Hedybius*, Er., *Illops*, Er., and *Philhedonus*, Gorh., represented in the Cape Town Museum, the Durban Museum, the British Museum in London, and the Hope Collection at Oxford. The Cape Town material, which includes the types of the various forms described or named by Abeille de Perrin in 1900 and examples of most of the species here enumerated, has been communicated by Dr. L. Péringuey, who has allowed me to retain co-types or duplicates for our National Collection. These genera, like many others of the group, are based almost entirely upon ♂-characters, and it is therefore impossible in some cases to locate with any certainty a ♀ example when that sex only is available for examination. Again, the head, antennæ, prothorax, or pygidium is sometimes differently coloured, or otherwise maculate, in the two sexes, at least in the genus *Hedybius*. The result is that several species have been described two or three times under different names. Paired examples of various S. African forms sent by Dr. Péringuey, and the abundant material obtained by

Dr. Marshall and the late H. C. Dollman in Rhodesia, &c., have fortunately enabled me to allocate one ♂ and several ♀ ♀, described as new species, to their respective partners. *Illops* and *Hedybius* have 5-jointed, and *Philhedonus* 4-jointed, anterior tarsi in ♂; the antennæ are distinctly 11-jointed in each of them, in both sexes, a character separating these genera from *Hapalochrus*. Under *Hedybius*, Erichson included species with simple anterior tarsi in ♂ and others with the second joint prolonged or raised at the apex above the base of the third in the same sex; *H. hirtus*, F. (=*oculatus*, Thunb.), is here taken as the type, although only one-fourth of the species now known agree with it in the tarsal structure, the others, which would be almost equally well placed under *Illops*, having the tarsi formed as in *Attalus*. Two important ♂-characters in *Hedybius* have hitherto been overlooked: (1) The strongly binodose and sulcate superior apices of the anterior femora (*H. marshalli*, Gorh.); (2) the presence of a shining black area above or beneath one or two of the basal joints (usually on 3 and 4) of the antennæ (*H. amœnus*, Gorh., &c.), in addition, in some cases, to a sharply-defined line or apical marking on the upper surface of five or more joints in the same sex. Another ♂-peculiarity in certain *Hedybii* is the tooth (*H. dentatithorax*, Pic, &c.) or notch (*H. marshalli*) at the sides of the prothorax, which is wanting in ♀. The extraordinary erosion, plication, or armature of the head in the males of these insects is difficult to describe; but it may be stated that, in the species with a central tuft of hairs on the anterior margin of the prothorax, the head is plicate or raised immediately in front of it. The structure of the head in this sex separates the numerous species belonging to the second section of *Hedybius* from *Attalus* s. str., the latter, as defined by Abeille de Perrin in 1891, having the "frons in mare simplex," *e. g.* formed as in the ♀. The elytra of the ♂ are without apical plication or excavation in all the species enumerated in the present paper; one of them, however (*H. flavocinctus*), has a sharp humeral plica in this sex.

ILLOPS.

Illops, Erichson, Entomographien, p. 67 (1840); Abeille de Perrin, Rev. d'Ent. xix p. 170 (1900) [type *I. corniculatus*, Er.].
Hedonistes, Gorham, P. Z. S. 1905, ii. p. 278.

A genus scarcely separable from the second section of *Hedybius*, and only differing from it in the greatly thickened or dentate fifth and sixth antennal joints in the ♂.

The elytra are coarsely punctured (as in *Hedybius diversipennis*, Pic), and the second joint of the anterior tarsi in ♂ is raised above the base of the third, as in *Attalus*.

1. *Illops corniculatus.*

Illops corniculatus, Er. loc. cit. p. 88 (♂)[1]; Ab. de Perrin, loc. cit. pp. 163, 170 (♂ ♀)[2].
Malachius trabeatus, Fairm. Ann. Soc. Ent. Belg. xxxviii. p. 654 (♀) (1894)[3].
Hedonistes lætus, Gorh. P. Z. S. 1905, ii. p. 278 (♂ ♀)[4].

♂. Antennæ (Pl. XIII. fig. 1*a*) long, joints 1–4 testaceous, the others black, 1 elongate, much thickened, 2–4 short, rapidly widening, 3 and 4 subconnate, 5 and 6 greatly dilated, 5 transverse, obliquely articulated to 4, 6 broader than 5, oblong-subquadrate, shining, somewhat concave above, 7–11 narrow, 11 very elongate; head (Pl. XIII. fig. 1) with a very deep, smooth, inter-ocular excavation, the latter with two small dentiform tubercles in front and another in the centre, and a stout, erect prominence on each side anteriorly, the vertex sharply, triangularly raised and deeply sulcate down the middle, the raised space preceded by two small porrect fascicles of yellowish hairs; anterior tarsal joints 1 and 2 slightly thickened, 2 at the apex raised above the base of 3.

Hab. S. Africa, Cape of Good Hope[1] (*type of Erichson*), Willowmore[4] (*Dr. Brauns*), Matjesfontein[2,3] (*E. Simon*), Maritzburg, Natal (*Mus. Cape Town*).

The above description of the ♂-characters is taken from specimens from Willowmore, whence Gorham's type of *H. lætus* was obtained, the latter agreeing well with Erichson's diagnosis of the same sex. Various ♀ ♀ doing duty for *I. corniculatus* in the British Museum and in the Hope Collection at Oxford are, however, referred to a different species, *I. duplocinctus*. This is a hairy, nigro-violaceous insect, with a granulate prothorax and very coarsely punctured elytra, the latter with a suturally-interrupted ante-median fascia and the apex orange-red. Two ♂ ♂ and four ♀ ♀ of *I. corniculatus* have been communicated by Dr. Péringuey, and these are all I have seen. M. Simon found it in numbers on an *Atriplex*, in the dried-up bed of a river, on a stony arid plateau, 30 leagues N.E. of the Cape. In the accompanying fig. 1 (Pl. XIII.) the head is drawn forward from its normal position.

2. *Illops dentiger*, sp. n.

♂. Extremely like *I. corniculatus*, Er., and very similarly coloured—nigro-cyaneous, the elytra with a suturally-interrupted ante-median fascia and the apex orange-red, the antennal joints 1–5 and clypeus testaceous; head (Pl. XIII. fig. 2) opaque, densely, rugulosely punctate, broadly depressed and strongly, transversely, sinuato-lamellate anteriorly, the ridge hollowed in the middle and near the sides above (appearing quadridentate when viewed from behind), and preceded by a deep transverse sulcus; eyes convex, prominent; antennæ (Pl. XIII. fig. 2 *a*) long, joint 1 very elongate, stout, 2 short, narrow, constricted at the base, 3 and 4 stouter than 2, subtriangular, 5 much broader, triangular, dentate at the outer apical angle, 6 produced into a long, curved, pointed tooth at the apex externally, 7–11 narrow, 11 elongate; prothorax transversely subcordate, convex, closely, rugulosely punctate (smoother than in *I. corniculatus*); elytra very coarsely, closely punctate; anterior tarsi as in *I. corniculatus*.

Length 4½ mm.

Hab. S. AFRICA, Seymour, Cape Colony (*Mus. Cape Town*).

Two males. Separable at once from *I. corniculatus*, ♂, by the very differently formed head and antennæ, the latter with the basal half testaceous, the less rugose prothorax, the more prominent eyes, and wholly opaque head.

3. *Illops duplocinctus*, sp. n.

♀. Broad, robust, shining, clothed with long, semierect, soft, pallid hairs; nigro-violaceous or nigro-cyaneous, the clypeus and the antennal joints 1–4 or 5 testaceous, the other joints and the legs black, the elytra orange-red, with a basal and subapical fascia (which are narrowly connected along the suture) violaceous. Head much narrower than the prothorax, closely, rather coarsely punctate, deeply excavate in the middle anteriorly; antennæ short, rather stout, joint 2 very short, 4 and 5 somewhat twisted and broader than the following joints. Prothorax transversely cordate, rugosely punctured at the sides, sparsely so on the disc. Elytra much broader than the prothorax, very coarsely, closely punctate, smoother at the base and apex, the punctures here and there transversely confluent.

Length 4½–5 mm.

Hab. S. AFRICA, Cape of Good Hope (*Mus. Brit.*, *Mus. Oxon.*).

Five ♀ ♀ : three, labelled "C. G. H.," in the Oxford Museum; two in the British Museum—one obtained from the Entomological Club in 1844, without locality, the other, purchased with the Bowring collection in 1863, labelled "Java," obviously in error. These insects are named in each collection *I. corniculatus*, Er., ♀, from which they differ in their much larger size, the non-granulate disc of the prothorax, and the greater extension of the reddish coloration on the elytra. The metallic, less rugose head, the much smoother disc of the prothorax, and the more coarsely punctured elytra separate them from *I. dentiyer*, with which I was at first inclined to associate them.

HEDYBIUS.

Hedybius, Erichson, Entomographien, p. 92 (1840) [type *Cistela hirta*, F. = *Cantharis oculata*, Thunb.].

Forty-two species are enumerated under this genus, nearly all the described forms, including males of thirty-two of them, being represented in the material examined. *H. æthiopicus*, Pic (1907), type ♂, from Uomba, Ethiopia, and *H. limbatipennis*, Pic (1915), types ♂ ♀, from Abyssinia, are unknown to me. *H.* (*Flabellohedybius*) *maculatipennis*, Pic (1917), type ♂, from Chindar, an insect with transversely plicate apices of the elytra, must belong elsewhere. *H. cavifrons*, Boh. (=*ferox*, Ab., and *natalensis*, Gorh.), is a *Dinometopus*.

The following Table will assist in the identification of the species of *Hedybius*, of which the ♂ ♂ are available for examination; five others are known from the ♀ only, and three from imperfectly described ♂ ♂, and their correct position is therefore uncertain:—

♂ ♂ *.

1 (14). Anterior tarsi simple. [HEDYBIUS s. str.]
2 (3). Prothorax cristate in the middle in front, testaceous, maculate on disc; elytra and abdomen metallic; legs testaceous. ...... Species 1.
3 (2). Prothorax not cristate in front.
4 (9). Elytra uniformly metallic.
5 (6). Elytra tuberculate; prothorax testaceous, sharply nigro-bivittate; legs testaceous; abdomen metallic .. .. Species 2

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* The structure of the ♂ anterior tarsi in Nos. 6, 7, 37 has not been described; ♀ ♀ only known of Nos. 28, 30, 35, 36, 38.

6 (5). Elytra not tuberculate.

7 (8). Prothorax metallic, except in front; legs partly or wholly black or metallic: species Malachiiform........................ Species 3, 4.

8 (7). Prothorax testaceous; antennæ partly testaceous, joints 1 and 2 or 1 only with a shining black mark above; head cristate .. Species 5.

9 (4). Elytra not uniformly metallic.

10 (11). Elytra immaculate, whitish or testaceous, like the rest of the body .... Species 6, 7.

11 (10). Elytra maculate.

12 (13). Prothorax, legs, and antennæ testaceous; elytra whitish, with longitudinal or interrupted black markings on disc .... Species 8.

13 (12). Prothorax and legs black; elytra metallic, with a common median space or transverse lateral patch testaceous or orange-red .... Species 9-11.

14 (1). Anterior tarsal joints 1 and 2 a little stouter and longer than those following, 2 raised at the apex above the level of 3 or prolonged over the base of the latter, nigro-pectinate at tip. [Subgen. HEDYBIINUS, n.]

15 (16). Anterior tarsal joints 1 and 2 imbricate; prothorax and elytra green, the former testaceous at the base; posterior tibiæ partly black; abdomen metallic.......... Species 12.

16 (15). Anterior tarsal joints 1 and 2 not imbricate.

17 (36). Elytra uniformly metallic (except in No. 22, vars.); prothorax testaceous, in most of the species nigro-maculate on the disc.

18 (35). Legs (except in No. 29) testaceous, wholly or in part.

19 (34). Terminal dorsal and ventral abdominal segments without projecting hooks or spines.

20 (21). Antennæ pectinate or acutely serrate, stout; prothorax very little broader than long in No. 13, cristate or horned in front, testaceous (maculate in No. 14).............. Species 13, 14.

21 (20). Antennæ serrate, dentate, or subfiliform; prothorax transverse, not cristate.

22 (23). Anterior femora binodose and sulcate at the apex above; prothorax notched at sides .. Species 15.

23 (22). Anterior femora simple.

24 (25). Prothorax dentate laterally; antennal joints 7-11, and the others in part beneath, black, in No. 16; antennæ testaceous, joints 3 and 4 each with a shining black area beneath, in No. 17 .... Species 16, 17.

25 (24). Prothorax rounded or subangulate laterally, slightly notched in No. 27.

26 (29). Antennæ maculate or lineate above.

27 (28). Antennal joints 1-11 or 5-11 nigro-maculate at the apex above, 3 and 4 each with a black shining area beneath in No. 18 .... Species 18-20.

28 (27). Antennal joints 1-11, 1-5, or 3-7 nigro-lineate above, 3 and 4 each with a shining black area beneath in No. 21 .... Species 21-23.

29 (26). Antennæ in great part or entirely testaceous above; the joints 3 and 4 in No. 25, and 4 only in No. 26, with a shining black area beneath.

30 (31). Fifth antennal joint dilated, triangular ...... Species 24.

31 (30). Fifth antennal joint not dilated.

32 (33). Pygidium not sulcate .. .. Species 25, 26.

33 (32). Pygidium sulcate (emarginate in No. 29) .... Species 27–30.

34 (19). Terminal dorsal and ventral segments of abdomen furnished with projecting black hooks or spines; prothorax cristate in No. 31, or angularly raised in No. 32, in the middle in front; legs wholly or in part black in Nos. 31, 32, testaceous in No. 33. . Species 31–33.

35 (18). Legs black; prothorax red, sometimes nigromaculate on the disc anteriorly; elytra subtuberculate in No. 34, finely punctured in Nos. 35, 36; abdomen black in Nos. 34, 35, red in No. 36 ... . Species 34–36.

36 (17). Elytra maculate or fasciate.

37 (40). Legs wholly or in part, prothorax, and elytra rufous or testaceous, the elytra violaceo- or cæruleo-maculate at base and at or towards apex.

38 (39). Elytral puncturing coarse; head with a central spine .... Species 37.

39 (38). Elytral puncturing fine; head without spine . Species 38, 39.

40 (37). Legs black or metallic.

41 (42). Prothorax and elytra violaceous, the latter each with a broad orange lateral patch.... Species 40.

42 (41). Prothorax at sides or base testaceous or rufous.

43 (44). Elytra maculate, without humeral plica . .. Species 41.

44 (43). Elytra narrowly unifasciate, with humeral plica .... Species 42.

1. *Hedybius hirtus.*

♀. *Cistela hirta*, Fabr. Spec. Ins. i. p. 149 (1781) [1].
Hedybius hirtus, Blair, Ann. & Mag. Nat. Hist (9) v. p. 162 (1920) [2].
♀. *Cantharis oculata*, Thunb. Dissert. iii. p. 202 (1801) [3].
♂. *Hedybius oculatus*, Er. Entomographien, p. 93 (1840) [4].

♂. Antennæ moderately long, stout, tapering towards the tip, testaceous in their basal half, the other joints black or more or less infuscate, 4–10 triangular; head (as in ♀) testaceous, nigro-maculate at the base in some specimens, narrower than the prothorax, depressed between the eyes, transversely angulato- or sinuato-plicate above, and sometimes raised in the centre beneath the prothoracic tuft (Pl. XIII. fig. 3); prothorax testaceous, with two small black spots on the disc and often two other smaller spots near the base, and furnished with a spiniform, porrect or upwardly-curved, matted fascicle of long black hairs in the centre in front;

elytra blue or bluish-green, rugulose, and rather closely punctured; anterior tarsi simple, 5-jointed.

♀. Antennæ short, rather slender, coloured as in ♂; head flattened, in some specimens slightly tumid between the eyes above, this tumid space depressed in the centre.

Var. 1. Prothorax usually with four small black spots; head and antennæ as in ♂ of *H. hirtus*; head in ♀ with a stout, transverse, mesially-interrupted ridge between the eyes above.

Hedybius quadrimaculatus, Pic, L'Echange, xix. p. 178 (♂ ♀) (1903)[5].

Var. 2. Smaller, the head nigro-maculate or black at the base, the two black spots on the disc of the prothorax sometimes coalescent and forming a transverse patch, which is produced into a dentiform projection in the centre behind, the two basal spots constantly present; the elytra less uneven and more closely punctured; head and antennæ of ♂ as in *H. hirtus*; coxæ testaceous. (♂ ♀.)

? *Hedybius simplicifrons*, Pic, Mélanges exot.-entom. xxv. p. 2 (♀) (1917)[6].

Hab. S. Africa (*Dr. Smith, in Mus. Brit.*), Cape of Good Hope[1 3 4 5 6] (*coll. Fry*; *Mus. Oxon.*; *C. Darwin*), Pirie Bush (*Mus. Brit.*), Saldanha Bay, Houwhoek, Caledon, Giftsberg, Cape Town, Willowmore, Algoa Bay (*Mus. Cape Town*), Rapenburg, Cape Flats, Ceres (*R. E. Turner*: x. 1920), Reenen, Bedford (*Mus. Durban*).

The males of this variable insect, a long series of which is before me, agree perfectly *inter se* in the structure of the head; but some of the larger females (from Pirie Bush, &c.) exhibit an unusual development of the vertex, which is wanting in the type. The two additional spots on the prothorax are evanescent, and those on the disc are sometimes coalescent. The dorsal and ventral surfaces of the abdomen are metallic. The type (♀) of *H. hirtus* is contained in the Banksian collection in the British Museum, and it is still in a fair state of preservation.

H. simplicifrons, Pic, seems to be based upon a similar ♀, with the coxæ testaceous.

The Var. 2 is represented by 5 ♂ ♂ and 6 ♀ ♀; it has been found at Ceres, Cape Province, and at Houwhoek in the Caledon district.

2. *Hedybius verrucosus*, sp. n.

♀. Elongate, broad, widened posteriorly, shining, somewhat thickly clothed with long, erect, blackish hairs intermixed on the elytra with closely-set whitish pubescence; blue or bluish-green, the head (except at the extreme base), antennæ, prothorax (two rather broad, laterally-angulate, black vittæ on the disc excepted), coxæ (the anterior pair excepted), and legs testaceous; the head and prothorax very sparsely, minutely punctate, the elytra closely, finely punctured and rather strongly verrucose. Head comparatively short, much narrower than the prothorax, transversely depressed between the eyes anteriorly; antennæ short, serrate. Prothorax much broader than long, convex, rounded at the sides. Legs hairy.

♂. Antennæ longer and stouter, joints 4–10 more or less infuscate above, 4–10 rounded at their inner apical angle; head (Pl. XIII. fig. 4) not, or scarcely, wider than in ♀, with a broad, deep, transverse excavation between the eyes above, which is limited on each side by an oblique sinuous ridge, the excavation (two testaceous spots excepted) black and opaque within, bifoveate in front, and interrupted at the middle by a short longitudinal plica; prothorax somewhat produced in the middle in front; anterior tarsi simple, 5-jointed.

Length 5–5½ mm. (♂ ♀.)

Hab. S. Africa, Grootfontein, Middelburg, Cape Province (*Mus. Brit.*: ♂ ♀), Willowmore and Hex River (*Mus. Cape Town*: ♂ ♀), Transvaal (*ex coll. Fry*).

Twelve examples seen, five of which are males: six from Willowmore were captured by Dr. Brauns on Aug. 15th, 1902; four from Grootfontein, received at the British Museum during the present year, are labelled as having been found with *H. clypeolus*, Er. The simple anterior tarsi and the relatively small head bring this species near *H. hirtus*, F. (= *oculatus*, Thunb.), from which it is separable by the sharply angulato-bivittate prothorax and the verrucose elytra, the ♂ with a black cephalic cavity and a non-cristate prothorax.

3. *Hedybius billbergi.*

♂. *Malachius billbergi*, Thunb. in Schönherr's Syn. Ins. i. 2, p. 79 (1806) [1].

Hedybius elongatus, Er. Entomographien, p. 96 (♀) (1840) [2].

Var. *Hedybius elongatus*, var. *luteonotatus*, Pic, L'Echange, xxvii. p. 157 (♂) (1011)[3].
Hedybius sp. ?, Dixey & Longstaff, Trans. Ent. Soc. Lond. 1907, p. 380[4].

♂. Head (Pl. XIII. fig. 5) broad, testaceous between and before the eyes, black at the base, the epistoma metallic; with a very deep oblique excavation on each side between the eyes and a transverse one in the centre, the former bordered externally by a very prominent oblique ridge and the central one by two small tubercles in front. Antennæ (Pl. XIII. fig. 5 *a*) long, joints 1–6 (except 1 above and the basal half of 5) testaceous, 7–11 black, 2 short, 3 much longer and stouter, 4 shorter than 3, dentate within, 5 elongate, abnormal, constricted at the middle, and with the basal portion dentate within, 6 not longer than 4, subdentate, 7–11 elongate, 7–10 widened, subtriangular, 7 slightly dentate at the tip within. Anterior tarsi simple.

♀. Head smaller, metallic; antennæ short, rather slender, joints 1–6 (except 1 above) more or less testaceous.

Hab. S. Africa, Blauwberg, Saldanha River, and Kalk Bay (*Mus. Cape Town*), Cape of Good Hope[1] [2] (*Mus. Brit.*), Rapenburg, Cape Flats (*R. E. Turner*: x. 1920), Simons Bay[4] (*G. B. Longstaff, in Mus. Oxon.*); E. Africa[3].

A long series of both sexes of this common Cape insect has been lent me by Dr. Péringuey. The ♂ is readily distinguished from the same sex of *H. smaragdulus* by the abnormally formed, basally maculate antennæ, and the metallic epistoma; the ♀ by the paler basal joints of the antennæ. Thunberg's type (♂ ?) has paler tibiæ and tarsi, but no reliance need be placed on this character, the tarsi, at least, being testaceous in some of the examples before me.

4. *Hedybius smaragdulus.*

Hedybius smaragdulus, Er. Entomographien, p. 96 (♂) (1840).

♂. Head (Pl. XIII. fig. 6) broad, bluish-black at the base, for the rest (the labrum excepted) flavo-testaceous, deeply excavate and transversely trifoveate in the middle, obliquely raised on each side between the eyes, the flavous portion smooth. Antennæ (Pl. XIII. fig. 6 *a*) long, black, joints 2–5 sometimes obscurely reddish, 2 very short, 3 and 4 moderately elongate, subequal, 5 much longer than 4, 6 shorter, not longer than 3; 7–11 elongate, 7–10 wider than the preceding joints, subtriangular. Anterior tarsi simple.

♀. Head smaller, metallic; antennæ short, rather slender, joints 6 and 7 subequal.

Hab. S. Africa, Cape of Good Hope (*Mus. Brit., coll. Fry*), Cape Town, Blauwberg, Saldanha Bay (*Mus. Cape Town*), Rapenburg (*R. E. Turner* : x. 1920).

I have seen numerous examples of this species, including ten males. It occurs with the much commoner *H. billbergi*, and is distinguishable therefrom by the smooth, flavous epistoma, and the normally-formed antennæ (joint 5 being simply elongated) of the ♂. The red space on the anterior part of the prothorax is perhaps more strongly bilobed posteriorly than in *H. billbergi*. Three smaller females from Cape Town (*Péringuey*), nigro-æneous in colour, thickly clothed with whitish pubescence and long, erect, darker hairs, with more densely rugulose elytra, and the anterior and posterior margins of the prothorax very narrowly testaceous, may represent another allied species?

5. *Hedybius variicornis.*

Hedybius variicornis, Boh. Ins. Caffraria, i. p. 467 (♂ ♀) (1851)[1]; Gorh. Ann. & Mag. Nat. Hist. (7) vii. p. 369 (♂ ♀) (1901)[2]; P. Z. S. 1905, p. 277[3].

Hedybius fasciculatus, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 173 (♂ ♀) (1900)[4]; Pic, L'Echange, xxiii. p. 131 (1907)[5].

♂. Antennæ long, moderately stout, variable in colour, usually with the basal four or five joints testaceous—a shining black spot or streak on the upper surface of 1 and 2, or on 2 only (wanting in one Natal ♂), excepted,—the other joints infuscate or black, 3 and 4 immaculate beneath, equal, 5–11 elongate; head (Pl. XIII. fig. 7) about as broad as the prothorax, flavous in front, the base and inter-ocular excavation black, the latter deep, bifoveate and obliquely plicate within, bordered on each side by a small angular elevation, and bearing a matted or scattered tuft of long, erect, black hairs in the middle; prothorax, apical half of abdomen, and legs (except the tarsi and posterior femora in some specimens) testaceous or rufo-testaceous; elytra blue or green, densely punctured; anterior tarsi simple.

♀. Antennæ short, rather slender, varying in colour as in ♂; head with the basal half black; pygidium black.

Hab. S. Africa, River Gariep[1]; Salisbury[2][3], Lonely, and Mwengwa, Rhodesia; Makapan[4], Bulawayo[5], Transvaal; Malvern, Frere, and Estcourt, Natal; Nyasaland.

I have seen about eighty examples of this species, including the types of Boheman and Abeille de Perrin, twenty males in all. It is recognizable amongst the allied forms by its small size, reddish prothorax, and the nigro-maculate one or two basal joints of the antennæ; the ♂ with the inter-ocular excavation bifoveate and bearing a tuft of erect black hairs, and the anterior tarsi quite simple.

Paired examples from Mwengwa are contained in Dollman's collection.

In one ♀ from Bulawayo the prothorax has an oblong blackish patch on the disc.

6. *Hedybius lividus.*

Hedybius lividus, Gorh. Ann. Mus. Genova, xviii. p. 508 (♂ ♀) (1883).

♂. "Capite fronte lamelli duplici dentiformi approximata; epistomate retrorsum in cornu duo producto, antennis articulis tertio ad sextum serratis intus nigro acuminatis."

Hab. ABYSSINIA (*Mus. Genoa*; *Mus. Brit.*).

A ♀ captured by Raffray is contained in the British Museum. It is narrower than *H. albipennis*, Gorh. (♀); the prothorax is more angulate laterally and the erect intermixed hairs on the elytra are soft, fine, and wholly pale. Dr. Gestro lent me a ♂ of it some time ago, but this specimen is not available now for study. The anterior tarsi in this and the following species are probably simple in the two sexes, as in *H. formosus*; their structure was not noted by Gorham.

7. *Hedybius albipennis.*

Hedybius albipennis, Gorh. Ann. & Mag. Nat. Hist. (7) vii. p. 360 (♂ ♀) (1901).

♂. "Antennis sesquilongioribus, ad apicem magis infuscatis; capitis vertice lamina transversa irregulari utrinque subinvoluta, occipite ab oculis fortiter excavato, in medio quasi bicarinato, postice elevato plano."

Hab. S. AFRICA, Salisbury [type] and Bulawayo, Rhodesia (*Dr. G. A. K. Marshall*), Kashitu, north of Broken Hill, N.W. Rhodesia (*H. C. Dollman*: 26. iv. 1915).

A robust, broad, testaceous insect, with whitish elytra, the abundant pubescence on the latter intermixed with long, scattered, erect, black setæ, a character separating *H. albipennis* from the very closely allied Abyssinian *H. lividus*. Eighteen specimens are before me, all ♀ ♀; the ♂-type was retained by the author, and it has presumably passed into the collection of M. Pic.

8. *Hedybius formosus.*

Malachius formosus, Reiche, in Galinier's Voyage Abyss., Ins. p. 290, t. 17. fig. 8.
Hedybius formosus, Gorh. Ann. Mus. Genova, xviii. pp. 597, 598 (♂ ♀) (1883).
Hedybius formosus, var. *bi-interrupta*, Pic, L'Echange, xxvi. p. 5 (1910).

♂. Head (Pl. XIII. fig. 8) flavous, very broad, wider than the prothorax, the inter-ocular excavation deep, sharply defined, divided by a strong, sinuous, transverse ridge, and bordered laterally by an angular, externally-convex, vertical, supra-ocular elevation, the excavation with a small, smooth, triangular cavity in the middle, in front of which is a short convex plica; antennæ rather slender, long, serrate; prothorax angularly dilated laterally, the margins strongly reflexed; anterior tarsi simple, 5-jointed; pygidium testaceous.

♀. Head not so wide, flattened, black in its basal half; antennæ more slender, short; pygidium black; prothorax less angulate at the sides.

Hab. ABYSSINIA (*Mus. Genoa*, *Mus. Brit.*).

One ♂ and two ♀ ♀ seen. There appears to be a long series of it in the Genoa Museum. *H. limbatipennis*, Pic (1914), from the same country, is said to be near the present species.

9. *Hedybius maculifer.*

♀. *Malachius bimaculatus*, Boh. Ins. Caffraria, i. p. 465 (1851) (nec Erichson, 1840)[1].
Hedybius (?) *maculifer*, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 174 (♀) (1900)[2].

♂. Head (Pl. XIII. fig. 9) as wide as the prothorax, testaceous in its anterior half, very deeply, transversely arcuato-excavate between the eyes, the excavation obliquely plicate on each side in front, extended in the middle anteriorly, and with a small raised point in the centre; antennæ short, rather stout, moderately serrate, joints 1–4 testaceous beneath; anterior tarsi 5-jointed, simple.

♀. Head black, flattened.

Hab. S. AFRICA (*Mus. Cape Town*), River Limpopo[1], Hamman's Kraal, near Pretoria[2].

Dr. Péringuey has lent me the type (♀) of *H. maculifer*, Ab., and also two males of the same species. The former agrees well with the description of *H. bimaculatus*, Boh., the type of which must be ♀. A small (length 3–3½ mm.), hairy, nigro-violaceous insect, with a large orange-yellow, outwardly-dilated patch at the sides of the elytra before the middle, as in *H. (Malachius) erichsoni*, Boh. The cephalic cavity is deep and broad, and the vertex is without tubercles. The antennæ are short in both sexes.

10. *Hedybius flavinasus*, sp. n.

♂. Moderately elongate, rather convex, shining, closely pubescent without longer erect hairs intermixed; black, the basal joints of the antennæ testaceous, the head in great part flavous (the base only black), the elytra violaceous, with a common, broad, angulate, outwardly-dilated orange fascia before the middle; the head at the base and the prothorax closely, very minutely, the elytra finely, distinctly, punctured. Head (Pl. XIII. fig. 10) as broad as the prothorax, the flavous anterior portion glabrous, almost smooth, and with a deep, transverse, arcuate excavation between the eyes anteriorly, the epistoma also excavate down the middle and bearing an erect compressed spine in the centre behind; antennæ rather short and stout, serrate. Prothorax transverse, convex, rounded at the sides. Elytra comparatively short, slightly widened posteriorly, broader than the prothorax. Anterior tarsi 5-jointed, simple.

Length $2\frac{4}{5}$ mm.

Hab. S. Africa, Bulawayo, Matabeleland (*Dr. G. A. K. Marshall*: xii. 1903).

One male. Closely related to *H. maculifer*, Ab. (= *bimaculatus*, Boh., nec Er.), and with similar ♂-characters; the elytra much more finely punctured, and with a complete orange ante-median fascia, the hairs much shorter and less erect.

11. *Hedybius trilobatus*, sp. n.

♂. Moderately elongate, slightly widened posteriorly, shining, sparsely cinereo-pubescent, the elytra with long, soft, pallid, semierect hairs; black with a slight bluish lustre, the antennal joints 2–4 in part, the head (the basal portion behind the median cavity excepted), the elytra (except at the base and apex), and the dorsal surface of the abdomen to about the middle, testaceous or orange-red, the rest of the elytra nigro-violaceous—the basal fascia narrow, widened towards the suture, the apical patch broader, bi-excised anteriorly; the basal portion of the head and the prothorax sparsely, minutely, the elytra closely, rather coarsely punctate. Head (text-fig. 1) a little broader than the prothorax, the frontal excavation broad, very deep, almost smooth and opaque within, trilobate anteriorly—the median lobe erect, the others oblique, angulate, compressed, dentate at the tip,—limited on each side by an angular supra-ocular prominence, and basally by a bisinuate ridge; antennæ very long, rather slender, the outer joints elongate, subfiliform. Prothorax transverse, obliquely narrowed posteriorly. Elytra moderately long, much wider than the prothorax, parallel at the base, rounded at the tip. Legs rather slender; anterior tarsi 5-jointed, simple.

Length 3½ mm.

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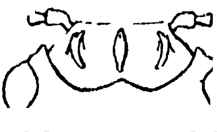


Head of *Hedybius trilobatus*, ♂.

Hab. South Africa, Cape of Good Hope (*Mus. Brit.*, *ex coll. Fry*).

One male. Separable from the males of *H. maculifer*, Ab. (=*bimaculatus*, Boh., nec Er.), and *H. flavinasus*, the only allied S. African forms known to me, by its larger size, the very long antennæ, the more extended, anteriorly trilobate frontal excavation, the greater development of the rufo-testaceous portion of the elytral surface, the coarser puncturing of the latter, &c. These insects bear some resemblance to various species of *Dinometopus*, which have a basally-constricted longer prothorax, &c.

12. *Hedybius clypeolus.*

Hedybius clypeolus, Er. Entomographien, p. 95 (♀) (1840)[1].
Hedybius coronatus, Fairm. Ann. Soc. Ent. Fr. 1888, p. 181 (♂ ♀)[2].

♂. Antennæ moderately long, strongly serrate, black, joints 1–5 partly testaceous (1 nigro-lineate above, 2–5 black along their inner edge); head broad (Pl. XIII. figs. 11, 11 *a*), flavous in front, the inter-ocular space and vertex testaceous, nigro-maculate before and behind the lateral prominences, the latter also with a black spot within, the inter-ocular cavity very deep, limited on each side by a stout, vertical, horn-like elevation, which is produced into a curved hook at the tip, the face large, tumid, truncato-bidentate above, each tooth bifid at the apex; prothorax strongly transverse, metallic green, the anterior and lateral margins narrowly, the basal margin rather broadly, testaceous; elytra green or bluish-green, densely rugulosely punctured, subparallel; abdomen metallic; legs set with very long hairs, testaceous, the posterior tibiæ to near the tip, and the intermediate tibiæ at the base, black, the posterior tarsi sometimes infuscate; anterior tarsal joints 1 and 2 imbricate, 2 nigro-pectinate at the tip.

♀. Antennæ short, rather slender, feebly serrate, testaceous to near the tip; head angularly viridi-bimaculate at the base.

Length 5½–6½ mm. (♂ ♀.)

Hab. S. AFRICA, Cape of Good Hope[1] (*type of Erichson* : ♀), Grootfontein, Middelburg (*Mus. Brit.*: ♂), Kimberley, Prieska (*Mus. Cape Town* : ♂ ♀), Damara[2] (*types of Fairmaire* : ♂ ♀).

Nine specimens of this species are before me: 5 ♂ ♂ and 4 ♀ ♀. The latter agree with Erichson's description of *H. clypeolus* (his type wanting the posterior legs), except in their rather larger size, and the two sexes with Fairmaire's *H. coronatus*. The ♂ anterior tarsi appear at first sight to be 4-jointed, owing to the second joint being articulated to the first near the base. The posterior tibiæ are in great part black in both sexes. The Grootfontein examples were found with *H. verrucosus* upon a species of *Melanthus*. Figs. 11, 11 *a* (Pl. XIII.) show the head from in front and behind.

13. *Hedybius lamelliger*, sp. n.

♂. Elongate, subopaque, the elytra shining, clothed with long, erect, black bristly hairs intermixed on the elytra with an abundant whitish pubescence; head (the inter-ocular cavities and base excepted, which are black), antennæ, palpi, prothorax (the black fovea in front excepted), and legs (except the intermediate tarsi in part, and the posterior tibiæ and tarsi entirely, which are infuscate) testaceous or flavous; scutellum, metasternum, and abdomen metallic, the elytra blue; the prothorax almost smooth, the head very finely, the elytra densely, rugulosely punctured. Head (Pl. XIII. fig. 12) broad, a little narrower than the prothorax, long as seen from in front (owing to the broad clypeus, and the vertical trifid face), with two large, black, sharply-defined, plicate, subtriangular cavities between the eyes above, the cavities separated by an elongate, parallel-sided, concave lamella, which is curved upwards into a short horn-like prominence behind; antennæ long, stout, joints 3–5 strongly serrate, 6–10 pectinate. Prothorax nearly as long as broad, rounded-subquadrate; deeply transversely foveate, binodose, and angularly raised in the middle in front, and with a tuft of short hairs arising from the central prominence. Elytra parallel, blunt at the tip. Legs hairy; anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3 above, black at the apex.

Var. ♂. Antennal joints 3–10 strongly, acutely serrate; prothorax shorter, transverse; elytra green.

♀. The basal half of the head, an elongate, scutiform patch on the disc of the prothorax, and the elytra green; the prothorax obsoletely bi-impressed in the centre in front.

Length 5–5½ mm. (♂ ♀.)

Hab. S. Africa, Ceres [type, ♂], O'Okiep [♂ ♀, var.] (*Mus. Cape Town*).

The specimen, ♂, selected as type was captured by Mr. L. M. Lightfoot in 1918, the others, 2 ♂ ♂ and 1 ♀, were found in November 1885. The variation in the ♂ antennal structure is unaccompanied by any difference in the form of the head in the same sex, and the Ceres and O'Okiep examples must therefore be treated as forms of the same species. *H. lamelliger* is not very closely allied to any of the *Hedybii* described by Gorham and others, but the following, *H. plicatilis*, is nearly related to it.

14. *Hedybius plicatilis*, sp. n.

♂. Elongate, somewhat shining, thickly clothed with whitish pubescence intermixed with long, erect, blackish hairs; bluish-green, the head (except the frontal cavities and base, which are black) and prothorax (except a large triangular patch on the basal half of the disc, the transverse fovea in front, and a streak along the sides extending from the middle forwards, which are black or metallic) flavous, the antennæ (a streak on joints 1 and 2 excepted) and palpi (the tip excepted), and the intermediate tibiæ and tarsi, testaceous, the posterior tibiæ and tarsi slightly infuscate; the head and prothorax very finely, the elytra densely, rugulosely punctured. Head (Pl. XIII. fig. 13) broad, narrower than the prothorax, with two extremely large, deep, oval excavations between the eyes above, the excavations separated by a long narrow lamella, which is raised and spoon-shaped behind, and bordered on each side by a slender rectangular plica (the three together forming a cruciform flavous prominence), the space in front of the two excavations raised (the face appearing long and bifid above, as seen from the anterior aspect); antennæ long, stout, pectinate. Prothorax transverse, obliquely narrowed from the middle to the base; abruptly depressed, deeply transversely foveate, and produced into a flattened, raised, horn-like prominence in the centre in front, the fovea preceded by an angular elevation. Elytra wider than the prothorax, subparallel, bluntly rounded at the apex. Anterior tarsal joints 1 and 2 thickened, 2 raised above the base of 3, black at the tip.

Length 5 mm.

Hab. S. AFRICA, Beaufort West (*Purcell, in Mus. Cape Town*).

One male. A very remarkable insect, difficult to describe, and comparable only with *H. lamelliger*, from which it is at once distinguished by the shorter, posteriorly-narrowed, sharply trimaculate prothorax, the metallic femora, and the elongate cavities on the head (these appearing triangular when viewed in profile), which are separated by a narrower anteriorly-depressed lamella, this being bordered by ┘-└-shaped flavous folds, together forming a cruciform elevation.

15. *Hedybius marshalli.*

Hedybius marshalli, Gorh. Ann. & Mag. Nat. Hist. (7) v. p. 81 (♂ ♀) (1900)[1].

? *Hedybius inarmatus*, Pic, Bull. Soc. Ent. Fr. 1917, p. 234 (♀)[2].

♂. Antennæ very long, rather slender, wholly testaceous, joint 3 perceptibly longer than 4, 3 and 4 without smoother area beneath; head (Pl. XIII. fig. 14) very broad, in great part testaceous, the inter-ocular excavation extremely deep, transversely nigro-lineate within, the vertical juxta-ocular prominence compressed, dentiform, rather small, and separated from a larger, oblique, black elevation behind it by a deep oblique groove; prothorax transversely subquadrate, notched at the sides before the base, with an extremely large, broad, triangular, opaque space on the disc, extending from near the anterior margin to the base, for the rest testaceous; elytra blue or bluish-green, densely punctate; abdomen and legs testaceous; anterior femora thickened, obliquely sulcate and strongly binodose at the apex above; anterior tarsal joint 2 slightly raised over the base of 3, nigro-pectinate at tip.

♀. Antennæ short, rather slender, testaceous; head with an anteriorly-bilobed black mark on each side at the base; prothorax shining, rounded at the sides, with two coalescent oblong black spots on the disc; pygidium testaceous, sometimes obsoletely sulcate at tip and with a small black spot on each side.

Hab. S. AFRICA, Estcourt[1], Natal' (*Mus. Brit.*: ♂ ♀), Port Natal[2], Mpanzi Mvoti (*Mus. Durban* : ♀).

Six ♂ ♂ and five ♀ ♀ seen, the latter corresponding with the description of *H. inarmatus*, Pic. The males have two black angular elevations on each side of the head, and a laterally-notched prothorax, the disc of which is almost covered by a very large, triangular, opaque, black patch. The head is nigro-maculate on each side at the base in both sexes. The two small spots on the pygidium and the apical depression are conspicuous in one of the females from Estcourt.

16. *Hedybius curvidens*, sp. n.

♂. Elongate, shining, clothed with pallid or whitish pubescence intermixed on the elytra with erect, black, bristly hairs; antennæ (Pl. XIII. fig. 15 *b*) about as long as the body, moderately stout, tapering outwards, joints 1–6 (a black line on 1 above, and on 1–5 beneath, excepted) testaceous, for the rest black, 3 and 4 short, 4 triangular, longer and wider than 3, 5 elongate, twice the length of 4 and broader than 6, parallel-sided, 6–10 elongate-subtriangular; head (Pl. XIII. figs. 15, 15 *a*) broad, flavous, the base, eyes, and median cavity black, the cavity very deep, broad, opaque within, and limited anteriorly by an irregular V-shaped ridge, in front of which are three foveæ, the flavous raised walls of the excavation curving backwards on each side above the eyes and terminating in a stout, sinuate, sharp tooth; prothorax transversely subquadrate, dentate at the sides behind the middle, the lateral margins obliquely reflexed and ciliate anteriorly, the dorsal black patch very large, scutiform, dentate in the middle behind, the rest of the surface testaceous; elytra subparallel, blue, densely, rugulosely punctured; metasternum metallic; abdomen and legs (except the tarsi of the intermediate pair, and the bases of the tibiæ, apices of the femora, and tarsi of the posterior pair, which are black) testaceous; anterior tarsal joints 1 and 2 thickened, 2 raised above the base of 3, black at the tip.

♀. Antennæ short, rather slender, joints 1–5 (a darker streak on 1 above excepted) testaceous, 6–11 black; head black in more than its basal half; prothorax rounded at the sides, the dorsal black patch reduced to two oval spots; elytra slightly widened posteriorly; pygidium nigromaculate.

Length 5–5¼ mm. (♂ ♀.)

Hab. NATAL, Ulundi, Drakensburg (*Dr. G. A. K. Marshall*: ♂ ♀ : i. 1893), Frere (*Mus. Cape Town*: ♂ ♀).

Two males and three females. A species easily recognizable by the structure of the antennæ, head, and prothorax in the ♂. The sides of the prothorax are dentate in this sex, as in *H. dentatithorax*, Pic. The ♀ may be known from that of *H. amœnus*, as here restricted, by the wholly black outer joints of the antennæ and the black posterior knees. The long parallel-sided fifth antennal joint of the ♂ is a striking character. The nigro-maculate pygidium of the ♀ is common to many *Hedybii* with testaceous abdomen. Figs. 15, 15 *a* (Pl. XIII.) show the head from in front and behind.

17. *Hedybius dentatithorax.*

Hedybius dentatithorax, Pic, Bull. Soc. Ent. Fr. 1917, p. 231 (♂ ♀)[1].
? *Hedybius amœnus*, Gorh. P. Z. S. 1905, ii. p. 277 (part.)[2].

♂. Antennæ (Pl. XIII. fig. 16 *a*) nearly as long as the body, rather slender, testaceous, joints 3 and 4 together about as long as 5, each with a polished, concave, black area beneath; head (Pl. XIII. fig. 16) broad, testaceous, black at the base (a spot in the middle of the vertex excepted), the inter-ocular excavation black along the centre, pubescent, extremely deep, with a recurved, dentiform plica in the middle in front and a smooth fovea behind it, the juxta-ocular elevations stout, angular, concave within (the excavation as seen from the anterior aspect limited in front by a curved ridge, which extends backward over and around the lateral prominences, enclosing an oval concave space); prothorax transversely subquadrate, dentate at the sides behind the middle, and with the lateral margins obliquely reflexed and ciliate anteriorly, the dorsal black patch transverse, dentate in the centre behind, the rest of the surface testaceous, the margins sometimes with a small black spot; elytra blue or green, densely, rugulosely punctured; abdomen, coxæ, and legs testaceous, the metasternum green; anterior tarsal joint 2 produced over the base of 3, black at the tip.

♀. Antennæ short, more slender, joint 11 black at the tip; head with about the basal half black, the black portion biangulate anteriorly; prothorax subangulate at the sides, the tooth wanting, the dorsal black patch incised in the middle in front and a little smaller; pygidium testaceous.

Length 4½–5 mm. (♂ ♀.)

Hab. S. Africa, "Interior" (*Mus. Brit., ex coll. Earl of Derby*: ♂ ♀); Bothaville[2] [♂ ♀], Newcastle, Natal [♂ ♀], Smithfield, Orange River [♀], Transkei [♀] (*Mus. Cape Town*); Transvaal[1] (*types of Pic*: ♂ ♀).

The twelve specimens (six of each sex) from which the above particulars are taken agree with the description of *H. dentatithorax*, except that the author does not allude to the polished black space beneath the third and fourth antennal joints in the ♂. The only other S. African species with toothed sides to the prothorax represented in the collections before me is *H. curvidens*, a very different insect. The ♀ is extremely like that of *H. marshalli*, Gorh. (=*inarmatus*, Pic), the latter having the black basal portion of the head reduced to two spots. Fig. 16*a* (Pl. XIII.) shows a ♂ antenna from beneath.

18. *Hedybius amœnus.*

Hedybius amœnus, Gorh. in Distant's Nat. in Transvaal, p. 197, pl. i. fig. 2 (♀) (1892)[1], Ann. & Mag. Nat. Hist. (7) v. p. 80 (♂ ♀) (1900) (part)[2]; [? P. Z. S. 1905, ii. p. 277 (♂ ♀)[3]]

? *Hedybius atropygus*, Pic, Mélanges exot. entom. xxv. p. 2 (♀) (1917)[4].

♂. Antennæ very long, rather slender, tapering outwards, testaceous, joints 3 and 4 widened, subequal, rounded at their inner apical angle, each with a long, shining, black area beneath, 5–11 elongate, nigro-maculate at the apex above; head (Pl. XIII. fig. 17) testaceous, black at the base and in the centre of the inter-ocular cavity, the latter broad, pubescent, deeply, transversely excavate and fasciculate in the middle anteriorly, and limited on each side by a stout, erect, angular prominence, in front of which is a tuft of hairs; prothorax testaceous, with a broad, oblongo-quadrate, posteriorly-bifurcate, black discoidal patch; elytra and metasternum blue or bluish-green; legs and abdomen testaceous, the pygidium included, the posterior tarsi sometimes infuscate; anterior tarsal joint 2 raised above the base of 3, nigro-pectinate at tip.

♀. Antennæ short, more slender, testaceous, joints 6–11 more or less black or infuscate at the tip; head black in its basal half, the black portion biangulate in front; prothorax with the discoidal patch more or less cleft or divided down the middle, sometimes followed by two small spots; pygidium black.

Hab. S. Africa, Estcourt[3] and Frere, Natal (*Dr. G. A. K. Marshall*: ♂ ♀), Pretoria[1], Transvaal (*type*, ♀, *of Gorham*), Johannesburg and Florida, Transvaal, Parys, Reenens Pass, Vredeport (*Mus. Cape Town*: ♂ ♀), Kroonstad, Orange River[4] (*Mus. Brit.*), Reenens (*Mus. Durban*: ♂ ♀).

H amœnus, as here restricted, may be described as a form of *H. plagiocephalus*, Er., with the antennal joints 3 and 4 widened, and with an elongate shining black area beneath, and 6–11 sharply nigro-maculate at the tip, in the ♂; the ♀ also has the outer joints similarly maculate. Nine ♂ ♂ from various localities are before me, two of them having an additional dark mark at the sides of the prothorax. The specimens from Bothaville (♂ ♀), subsequently referred by Gorham[3] to *H. amœnus*, probably belong to *H. dentatithorax*, Pic.

19. *Hedybius bimaculatus.*

Hedybius bimaculatus, Er. Entomographien, p. 94 (♀) (1840)[1].
Hedybius maculicornis, Pic, L'Echange, xxvii p. 157 (♂) (1911)[2].

♂. Antennæ very long, tapering towards the tip, moderately serrate from joint 3 onwards, testaceous, joints 3–11 at the apex above and beneath, and 1 with a streak above, black (the black mark beneath 3 and 4 rugulose and opaque), 3 and 4 triangular, subequal, each a little shorter than 5, 5–11 elongate; head (Pl. XIII. fig. 18) black, except in front, very deeply eroso-excavate between the eyes, the excavation finely pubescent within, raised and fasciculate in the centre in front, limited anteriorly by a prominent curved ridge and laterally by a sharp, angular, ciliated, erect tooth, the face rather short; prothorax rounded at the sides, testaceous, with two small black spots on the disc; elytra and metasternum blue or green, the former rather coarsely punctured; legs and abdomen testaceous; anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3, black at the tip.

♀. Antennæ short, more slender, the joints from 4 onwards more or less infuscate or black at the apex, above and beneath; head with the exposed basal half black, testaceous in front; prothorax as in ♂; pygidium black.

Hab. S. Africa[2], Cape of Good Hope[1] (*type of Erichson*; *Raffray, in Mus. Cape Town*; *Mus. Oxon.*), Stellenbosch, Ceres, Rondebosch, Mooresbosch, Hopefield (*Mus. Cape Town*).

Redescribed from a pair from Stellenbosch (mounted on the same piece of card) communicated by Dr. Péringuey, the sexes agreeing with the respective published descriptions; three other males are also available for examination, the one from Ceres 4 mm. only in length. Very like *H. amœnus*, Gorh., but easily separable, in the male sex, by the absence of the shining oblong black areas beneath the antennal joints 3 and 4 (these joints being simply maculate above and beneath in *H. bimaculatus*), the more rounded sides of the prothorax in both sexes, the discoidal marking reduced to two small spots, and the more coarsely punctured elytra. Two ♀ ♀ in the British Museum are without locality-label. The ♂ in the Oxford Museum, from an old collection, is correctly named.

20. *Hedybius quadricornis.*

Hedybius quadricornis, Gorh. P. Z. S. 1905, ii. p. 276 (♂ ♀).

♂. Antennæ long, stout, tapering, testaceous, joints 1–11 nigro- or fusco-maculate at the tip above, 3–10 triangular, 3 as long as 4; head (Pl. XIII. figs. 19, 19*a*) broad, testaceous, green at the extreme base, very deeply eroso-excavate, the cavity limited on each side of the anterior margin by two shining tuberculiform prominences, and laterally by two horn-like processes—the upper one very stout, erect, nigro-setose in front, the lower one curved downward, long, more slender, ciliate at the tip; prothorax arcuately produced in the middle in front; anterior tarsal joint 2 with a claw-like prolongation extending over the base of 3; abdomen testaceous at the apex, above and beneath.

♀. Antennæ much shorter, rather slender, the basal joints testaceous, the others infuscate; pygidium black.

Length (to tip of elytra) 3½ mm. (♂ ♀.)

Hab. S. Africa, Willowmore, Cape of Good Hope (*Dr. Brauns*: 1. v. 1903).

A rather small form, with the head (except at the extreme base), prothorax, and legs (the posterior tarsi excepted) testaceous; the elytra greenish or æneous, densely, finely punctate, with a few erect hairs intermixed with the close silvery pubescence; the prothorax convex, dull, minutely punctate. The ♂ cephalic armature is very different from that of any of the allied species. Two pairs of *H. quadricornis* have been lent me for examination by Dr. Péringuey. Figs. 19, 19*a* (Pl. XIII.) show the head from above and in profile.

21. *Hedybius lineaticornis*, sp. n.

♂. Antennæ stout, tapering, nearly as long as the body, joints 1–11 more or less distinctly nigro- or fusco-lineate above, 3 and 4 triangular, each with a shining black area beneath, 4 broader and slightly longer than 3, 5–10 elongate-subtriangular; head (Pl. XIV. fig. 20) broad, flavescent, transversely, sinuately nigro-lineate within the median cavity and black at the base, the excavation deep, pubescent, and divided by a transverse pallid plica, the anterior walls of the cavity curving backwards on each side over the eyes and enclosing an oval depression behind; prothorax testaceous, with two confluent oblong black spots on the disc, the transverse patch thus formed dentate in the middle behind; elytra and metasternum green or bluish-green, the former densely punctured; abdomen and legs testaceous; anterior tarsal joint 2 slightly produced over the base of 3, black at the tip.

♀. Antennæ short, rather slender, joints 6–11 infuscate towards their apices; head black in its basal half; pygidium black.

Length 3⅘–4⅘ mm. (♂ ♀.)

Hab. Orange River Colony, Bloemfontein Kopje and near Norvals Pont (*E. B. Poulton*: ix. 1905), Likhoele, Basutoland, and Smithfield, O.R.C. (*Mus. Cape Town*).

The above description is taken from three pairs captured by Prof. Poulton, a pair from Likhoele, and two males from Smithfield. Pic's "description abrégée" of *H. atropygus* (1917), type ♀, from Orange River, may apply to this species or to *H. amœnus*, the black pygidium being common to the females of these and other allied forms; but in the absence of the ♂ it would be impossible to locate his insect with certainty.

22. *Hedybius deliquescens*, sp. n.

Hedybius amœnus, Gorh. Ann. & Mag. Nat. Hist. (7) v. p. 80 (♂) (part.) (1900)[1].

♂. Antennæ (Pl. XIV. fig. 21 *a*) long, shorter than in *H. amœnus*, stout, tapering outwards, testaceous, joints 3–6 or 7 nigro-lineate above, 3 and 4 without shining black area beneath, 3 a little narrower than 4, 4–8 somewhat rounded on their inner edge (4–8 not subangulate at the apex as in *H. amœnus*); head (Pl. XIV. fig. 21) broad, testaceous, except at the base, very deeply excavate between the eyes, the excavation with two shining, angular, black spaces and a central, dentiform, erect plica (the depressed area appearing trisulcate), the juxta-ocular prominences large, dentiform, ciliate anteriorly, the face shorter than in *H. amœnus*; prothorax also shorter and more transverse, broadly explanate at the sides behind the middle and then abruptly narrowed to the base, the black discoidal patch subquadrate, excised in front, the rest of the surface testaceous; elytra blue or bluish-green, with the apex narrowly testaceous in some specimens, densely, rugulosely punctate; legs and abdomen testaceous, the metasternum metallic, the pygidium nigro-bimaculate; anterior tarsal joints 1 and 2 slightly thickened, 2 black at the tip.

♀. Antennæ short, slender, joints 6–9 obsoletely nigro-maculate; head with the basal half black; pygidium black.

Var. The elytra with two broad bluish-green fasciæ—one basal and the other subapical, the latter narrowly interrupted at the suture,—for the rest testaceous. (♂.)

Length 4 mm. (♂ ♀.)

Hab. NATAL, Estcourt[1] and Frere (*Dr. G. A. K. Marshall*); Mfongosi, Zululand (*W. E. Jones, in Mus. Cape Town*: var.).

Described from 5 ♂ ♂, one ♀, and a ♂ of the maculate variety, the males of the two forms agreeing precisely in their structural characters. Gorham, in his second account of *H. amœnus*[1], noticed the colour of the antennæ of one of these males; but he failed to observe the difference in structure of the antennæ themselves, as well as that of the head in the same sex. *H. lineaticornis* and *H. braunsi* also have some of the antennal joints similarly lineate above in ♂. The variation in the colour of the elytra is quite exceptional in the present genus.

23. *Hedybius braunsi*, sp. n.

♂. Moderately elongate, shining, clothed with whitish pubescence intermixed with long erect hairs; the head and prothorax sparsely, minutely, the elytra densely, finely, rugulosely punctured. Antennæ slender, tapering, nearly as long as the body, testaceous, joints 1–4 or 5 nigro-lineate above, 3 and 4 without shining black area beneath, 3–5 elongate-subtriangular, equal in length, 6–11 still longer, 11 longer than 10; head (Pl. XIV. fig. 22) broad, flavous or testaceous, black at the base (except at the middle of the vertex), depressed and trifoveate between the eyes (the two anterior foveæ oblique and usually black), the depression limited on each side by a concave, oval, raised space, the face (as seen from in front) bifoveate above; prothorax strongly transverse, rounded at the sides, testaceous, nigro-bimaculate on the disc, the black markings sometimes narrowly produced behind; elytra and metasternum green, the elytra parallel and comparatively short; legs and abdomen testaceous; anterior tarsal joints 1 and 2 thickened, 2 raised above the base of 3, nigro-pectinate at tip.

♀. Antennæ short, rather slender, testaceous; prothorax with two rather small oblong black spots; pygidium black, not sulcate.

Length $3\frac{1}{2}$–$4\frac{1}{4}$ mm. (♂ ♀.)

Hab. S. Africa, Willowmore (*Dr. Brauns*: ♂ ♀), Prieska [♂], Kimberley [♀] (*Mus. Cape Town*).

Four males and three females, communicated by Dr. Péringuey. A small form resembling *H. lineaticornis*, but differing from it in the more slender, differently-coloured antennæ in the ♂, the third and fourth joints of which are elongate and want the shining black area beneath. The ♀ is smaller than that of *H. erosus*, Er., and wants the deep median sulcus on the pygidium.

24. *Hedybius sculpticeps.*

Hedybius sculpticeps, Gorh. P. Z. S. 1905, ii. p. 275 (♂ ♀).

♂. Antennæ (Pl. XIV. fig. 23 *a*) very long, tapering outwards, testaceous, joint 11 at the tip and the inner edge of 2–5 black, 3 longer than 4, 4 triangular, 5–11 elongate, 5 much widened, triangular, 6–10 more or less angulate at their inner apical angle; head (Pl. XIV. fig. 23) large, in great part flavous, very deeply eroso-excavate, the cavity with an X-shaped black patch which is continued backwards to behind the eyes, the face or anterior portion vertical, greatly developed, deeply sulcate in the middle above; anterior tarsal joint 2 raised above 3 at the tip, nigro-pectinate at apex.

♀. Antennæ much shorter, slender, feebly serrate, joints 5–11 more or less infuscate, 3 and 4 subequal, 5 a little wider than 6.

Length (to tip of elytra) $4\frac{1}{2}$–5 mm. (♂ ♀.)

Hab. S. Africa, Willowmore (*Dr. Brauns*: x. 1915).

Dr. Péringuey has lent me a male and two females of this species. The triangular dilatation of the fifth antennal joint is a remarkable character in the ♂. The prothorax is strongly transverse, flavous, with a broad nigro-cæruleous patch extending across the disc; the elytra are densely, rugosely punctured, brilliantly metallic cupreo-violaceous, tinted with green or blue; the abdomen is metallic; the intermediate and posterior legs are partly infuscate in both sexes. Gorham's measurements must have included the projecting tip of the abdomen. The ♀ of the present insect is very like that of *Philhedonus coriaceus* (Er.), one of the specimens from Willowmore having been mounted with a ♂ of the latter on the same stage.

25. *Hedybius plagiocephalus.*

Hedybius plagiocephalus, Er. Entomographien, p. 93 (♂ ♀) (1840)[1].

♂. Antennæ very long, rather slender, slightly tapering outwards, testaceous, joints 3–10 more or less angulate at their inner apical angle, joints 3 and 4 subtriangular, subequal in length, each with a small shining black area at the apex beneath, 5–11 elongate, 11 black at the tip; head (Pl. XIV. fig. 24) testaceous, black at the base and in the centre of the deep pubescent inter-ocular cavity, which is shaped as in *H. amœnus*, and bordered laterally by an angular, erect prominence preceded by a tuft of hairs; prothorax testaceous, with a large black, posteriorly-bifurcate discoidal patch, which is sometimes greatly extended outwards; elytra and metasternum blue or bluish-green; legs and abdomen testaceous, the posterior tarsi infuscate; anterior tarsi as in *H. amœnus*.

♀. Antennæ short, more slender, the outer joints sometimes infuscate; pygidium black.

Hab. S. Africa (*Mus. Brit.*: ♂), Cape of Good Hope[1] [♂ ♀], Port Elizabeth and Uitenhage [♀] (*Mus. Oxon.*), Howick, Natal [♂] and Caffraria [♀] (*Mus. Brit.*), Algoa Bay [♂ ♀] and Transkei [♂] (*Mus. Cape Town*), Grahamstown (*ex coll. Fry and Mus. Durban*: ♂).

The nine males seen agree with Erichson's description in having long, testaceous antennæ in the ♂, the small black marks beneath joints 3 and 4 being almost invisible from above. The ♀ seems to be separable from that of *H. amœnus* by the non-maculate antennæ. The ♂ cephalic cavity wants the hook-like prominence in the centre in front visible in the allied *H. dentatithorax*, Pic, the ♀ of the latter, moreover, having the pygidium testaceous in the two sexes. The pair from Algoa Bay, communicated by Dr. Péringuey, has enabled me—as was the case with *H. bimaculatus*, Er.—to define with certainty the sexes of the present species.

26. *Hedybius superciliosus.*

♂. *Hedybius superciliosus*, Boh. Ins. Caffraria, i. p. 466 (1851)[1].
Hedybius anceps, Gorh. Ann. & Mag. Nat. Hist. (7) v. p. 81 (♂ ♀) (Jan. 1900)[2].
Hedybius prænotatus, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 173 (♂) (Oct. 1900)[3].
? *Hedybius pygidialis*, Pic, L'Echange, xxvii. p. 157 (♀) (1911)[4].

♂. Antennæ very elongate, as long as or longer than the body, tapering towards the apex, testaceous, joint 4 with a shining black area beneath (noticed by Boheman and not mentioned by Gorham), 11 black at the tip above; head (Pl. XIV. fig. 25) very broad, the interocular excavation extremely deep, fasciculate in the centre in front, black within, the vertical, anteriorly-ciliate, juxta-ocular prominences testaceous, thickened and very conspicuous; prothorax usually immaculate, rarely with two very small black spots on the disc; elytra blue or bluish-green, densely punctate; abdomen (pygidium included) and legs testaceous; anterior tarsal joint 2 extended over the base of 3, nigro-pectinate at tip.

♀. Antennæ short, rather slender, slightly infuscate in their outer half; head black in more than the basal half; pygidium nigro-maculate.

Hab. S. Africa, River Limpopo[1], Vryburg in Bechuanaland[3], Estcourt, Malvern, Frere, and Durban, Natal, Transvaal[4].

Numerous examples of each sex are before me, the males showing the shining black area beneath the fourth antennal joint noted by Boheman. The type (♀) of *H. prænotatus*, Ab., lent me by Dr. Péringuey, agrees exactly with the same sex of *H. anceps*, Gorh.; the "spots" near the anterior margin of the prothorax in the former are due to portions of the base of the head showing through the transparent chitin of the pronotum, the true spots, which are rarely present in either sex, arising from the convex disc. A ♂ from Natal in the Cape Town Museum is marked as having been compared with Boheman's type.

27. *Hedybius erosus.*

Hedybius erosus, Er. Entomographien, p. 93 (♂) (1840)[1].
Hedybius sycophanta, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 172 (♀) (1900)[2].
? Var. *Hedybius multimaculatus*, Pic, Mélanges exot.-entom. xxv. p. 2 (♀) (1917)[3].

♂. Antennæ very long, tapering outwards, moderately serrate, testaceous, joint 1 streaked with black above, 3 and

4 without black area beneath; head (except in front and behind the eyes) in great part black, broad, the inter-ocular space very deeply eroso-excavate, the excavation shining, with a testaceous mark (which is flavo-ciliate behind) in the middle in front, and limited on each side posteriorly by a stout angular prominence, the epistoma sulcate (Pl. XIV. fig. 26); prothorax testaceous, with a spot beneath the anterior angles, a broad, laterally-excised, posteriorly-bifurcate median vitta, and a small spot on each side of it (these sometimes coalescent with the median stripe) black, the lateral margins in some specimens distinctly notched behind the middle; elytra and metasternum green or bluish-green, the elytra densely, rugulosely, rather finely punctate; legs and abdomen in great part testaceous, the pygidium nigro-bimaculate and deeply sulcate; anterior tarsal joints 1 and 2 thickened, 2 raised above the base of 3, black at the tip.

♀. Antennæ short, rather slender, wholly testaceous; head flattened, testaceous, nigro-bimaculate at the base; prothorax with the black median vitta broken up into two oblong patches on the anterior part of the disc and two small spots near the base (the latter sometimes obsolete), the adjacent spots wanting; pygidium black, deeply sulcate as in ♂.

Length 5–5½ mm. (♂ ♀.)

Hab. S. Africa, Cape of Good Hope[1], Matjesfontein[2], Lion's Head, Cape Town, Willowmore, Dunbrody[3], Smithfield, Orange River Colony, Likhoele, Basutoland.

An imperfectly known insect, distinguishable in both sexes by the deeply sulcate pygidium. Dr. Péringuey has lent me paired examples of *H. erosus* and the unique type (♀) of *H. sycophanta*, the ♀ ♀ agreeing perfectly *inter se*. *H. multimaculatus* (type ♀) has two small additional spots at the base of the prothorax. The series in the Cape Town Museum includes six males.

28. *Hedybius longicoxis.*

Hedybius longicoxis, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 172 (♀) (1900).

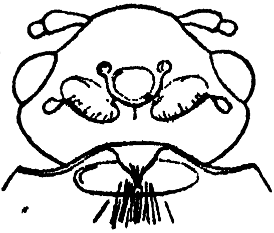
Hab. S. Africa, Pretoria.

This species, the type (♀) of which is before me, seems to be nearly related to *H. erosus*, Er. It has the head, antennæ (the extreme tip excepted), prothorax, coxæ, legs, and abdomen (the nigro-fasciate pygidium excepted) flavous, the elytra and metasternum bluish-green; the head with two very large patches at the base, and the prothorax with a broad median vitta (which is cleft in front and obliquely biramose behind), black; the head and prothorax are opaque and the elytra shining, the latter densely, finely punctate; the head is very large. The pygidium is feebly sulcate at the tip (as in some ♀ ♀ of *H. marshalli*), the groove being much shorter and shallower than in *H. erosus* and *H. sulcipygus*. The type is labelled, in the author's handwriting, "*Hedybius longicoccyx*," the specific name obviously referring to the shape of the broad prothoracic vitta, which resembles that of *H. erosus*, Er., ♂; the published name "*longicoxis*" must therefore have been a misprint, but, unfortunately, it cannot now be changed.

29. *Hedybius kabetensis*, sp. n.

♂. Elongate, widened posteriorly, shining, thickly clothed with cinereous pubescence which is abundantly intermixed with long, erect, soft, blackish hairs; black, the antennæ (except at the base and apex) testaceous, the prothorax flavous, the elytra with a bluish or greenish lustre, the ventral segments 1–4 wholly or in part rufescent; the head and prothorax extremely finely, the elytra densely, roughly punctate. Head (text-fig. 2) broadly hollowed above and with three large deep foveæ between the eyes, two small foveæ in front of these, and a stout, angular, post-ocular prominence on each side, the central fovea bordered posteriorly by an arcuate ridge; antennæ moderately long, serrate. Prothorax transverse, a little wider than the head, rounded at the sides, obliquely narrowed behind, transversely excavate anteriorly, and with the anterior margin produced in the middle into a long, triangular, dentiform, porrect process, the black hairs on the disc condensed into a scattered tuft behind the cavity in one specimen. Elytra moderately elongate. Pygidium constricted and abruptly narrowed

Text-fig. 2.



Head of *Hedybius kabetensis*, ♂.

beyond the middle, the produced apical portion deeply subtriangularly emarginate at the tip, and raised on each side from near its base. Anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3.

♀. Antennæ almost wholly black; pygidium not constricted posteriorly, simple.

Length 4¼ mm. (♂ ♀.)

Hab. E. Africa, Kabete (*T. J. Anderson*: 28. ii. 1918).

Two pairs. Near *H. hamatipygus*, from Rhodesia and the Transvaal, the elytra densely, roughly punctured, and the legs black; the ♂ with antennæ almost wholly testaceous, the frontal cavity deeply trifoveate, and the pygidium black and very differently shaped. *H. cucullatus* and *H. acanthopygus* are also nearly related to the present insect. *Attalus grandis*, Ab., from Abyssinia (type ♀?) (1890), a ♀ of which, found by Raffray, is before me, will perhaps prove to be congeneric, when the ♂ is found.

30. *Hedybius sulcipygus*, sp. n.

♀ Moderately elongate, rather broad, widened posteriorly, shining, the elytra clothed with whitish pubescence intermixed with long, erect, blackish bristly hairs, the rest of the surface and the legs with long, soft, pallid hairs; testaceous, the eyes, two small oblong spots on the disc of the prothorax, scutellum, anterior coxæ, and pygidium infuscate or black; the head and prothorax very sparsely, minutely, the elytra densely, finely, subrugulosely punctate. Head nearly as wide as the prothorax, transversely excavate anteriorly; antennæ short, slender. Prothorax strongly transverse, rounded at the sides. Elytra moderately long. Pygidium sulcate.

Length 3¾ mm.

Hab. S. Africa, Salisbury (*Dr. G. A. K. Marshall*).

One specimen. Separable from all the allied S. African forms by the wholly testaceous head. The only other species known to me with a sulcate pygidium are *H. erosus*, Er., and *H. longicoxis*, Ab., which are much larger forms, the former having more coarsely punctured elytra. *H.* (*Malachius*) *viridipennis*, F., from the Cape of Good Hope, a species not identified by Erichson or myself, has a red head, but its identification with the insect before me is too doubtful to be accepted; the description is as follows:—"M. pubescens rufus elytris pectoreque viridi-æneis. . . . Statura omnino præcedentium [*Collops 4-maculatus*, F.]. Caput rufum, immaculatum. Thorax rufus macula mediana obscura. Elytra viridia, nitida, immaculata. Corpus rufum pectore viridi."

31. *Hedybius hamatipygus*, sp. n.

♂. Elongate, much widened posteriorly, shining, thickly clothed with whitish pubescence intermixed with long, erect, darker hairs; head (the labrum excepted), the terminal three or four outer joints of the antennæ, the scutellum, tibiæ, and the tarsi in part in one specimen black, the rest of the antennæ (except joint 1 above), the prothorax, the femora to near the tip, anterior coxæ, and abdomen rufous or testaceous, the elytra and metasternum blue or bluish-green; the head and prothorax obsoletely punctulate, the elytra uneven and densely, finely, subrugulosely punctured. Head (Pl. XIV. fig. 27) narrower than the prothorax, with a very broad, deep, shining, arcuate, frontal excavation, which is limited on each side by a stout, subconical, supraocular tooth, and anteriorly by a bisinuate plica, the plica interrupted in the middle by a short, stout, cleft, ciliate, horn-like prominence; antennæ moderately long, stout. Prothorax transverse, convex, obliquely narrowed posteriorly; produced and transversely excavate in the centre anteriorly, and furnished with a spiniform, erect, matted tuft of black hairs in front. Elytra wider than the prothorax, incompletely covering the abdomen. Pygidium abruptly constricted before the apex; the apical portion narrow, tubulate, deeply semicircularly emarginate, and armed on each side with a stout, blackish, downwardly-curved hook, the terminal ventral segment excavate and armed with similar upwardly-curved hooks. Legs very hairy; anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3.

Length (to tip of elytra) 4–4½ mm.

Hab. S. Africa, Pretoria, Transvaal (*L. M. Bucknill*: 1913: type), Salisbury, Rhodesia (*Dr. G. A. K. Marshall*: iii. 1895).

Two males, precisely similar. This species somewhat resembles *H. hirtus*, F. (= *oculatus*, Thunb.), which has simple anterior tarsi, &c. The ♂ pygidial armature is very remarkable.

32. *Hedybius cucullatus*, sp. n.

♂. Moderately elongate, shining, thickly clothed with pallid or whitish pubescence intermixed with long, erect, soft hairs; brassy-black, the head above, the prothorax, and abdomen testaceous, the antennæ infuscate with the basal joints testaceous beneath; the head obsoletely, the prothorax somewhat closely, punctulate, the elytra shagreened and rugulosely punctulate. Head (Pl. XIV. fig. 28) narrower than the prothorax, with an oblique, deep, angulate groove on each side between the eyes above, the two grooves transversely coalescent on the vertex, and each limited behind by a tuberculiform plica, the central space raised, triangular, and truncate posteriorly; antennæ very elongate, rather stout, sharply serrate. Prothorax transverse, obliquely narrowed posteriorly; deeply foveate, binodose, and produced in the middle in front, the anterior margin triangularly raised in the centre. Elytra broader than the prothorax, rapidly widening posteriorly. Legs slender, hairy; anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3. Pygidium emarginate, and armed with a stout black hook on each side at the tip, the terminal ventral segment bifid.

Lenth 3⅛ mm.

Hab. E. AFRICA, W. slopes of Kenya on the Meru–Nyeri Road, alt. 6000–8500 ft. (*S. A. Neave*: ii. 1911).

One male. Near *H. hamatipygus* (♂), the antennæ very long and sharply serrate, the prothoracic tuft replaced by a triangular elevation of the anterior margin, the legs black, the head testaceous above.

The Abyssinian *Attalus grandis*, Ab. (type ♀?), is very like the present insect, but it is larger and has longer elytra. The ♂ cephalic structure is somewhat similar to that of *H. simoni*, Ab., and *H. acanthopygus*.

33. *Hedybius acanthopygus*, sp. n.

♀. Moderately elongate, slightly widened posteriorly, shining, thickly clothed with whitish or pallid pubescence intermixed on the elytra with long, erect, bristly hairs; testaceous, the eyes, antennæ (the basal joints in part excepted), scutellum, and tip of pygidium black, the elytra and metasternum blue or bluish-green; the head and prothorax obsoletely punctulate, the elytra densely, very finely subrugulosely punctured. Head narrower than the prothorax, flattened; antennæ short, serrate, rather slender. Prothorax transverse, rounded at the sides. Elytra moderately long.

♂. Antennæ longer and stouter, the basal five or six joints usually testaceous; head (Pl. XIV. fig. 29) shining and flavescent anteriorly, subopaque at the base, with a deep, irregular, arcuate furrow between the eyes above, and a raised, transversely-cordate, deeply bifoveate space in the middle, the lateral margins of which are sometimes elevated into a small tooth behind; pygidium constricted at the apex, and there armed with two long, curved, black spines, the terminal ventral segment with two similar spines; anterior tarsal joints 1 and 2 thickened, 2 extending over the base of 3, black at the tip.

Length 2⅘–3⅕ mm. (♂ ♀.)

Hab. S. Africa, Salisbury, Rhodesia (*Dr. G. A. K. Marshall*: i. 1895, ii. 1906).

Five ♂ ♂, 3 ♀ ♀. A small form, with testaceous head, prothorax, and legs, and bluish-green elytra; the male with a transversely-cordate, bifoveate, raised area in the middle of the head, followed by a deep subarcuate groove, and the tip of the abdomen armed with four long black spines. The antennæ vary in colour, and in one ♂ there is a scutiform dark patch on the disc of the prothorax. The ♂ cephalic structure is very like that of *H. simoni*, Ab.

34. *Hedybius aulicus.*

♀. *Cistela aulica*, Fabr. Spec. Ins. i. p. 148 (1781)[1].
Hedybius aulicus, Blair, Ann. & Mag. Nat. Hist. (9) v. p. 162 (1920)[2].
Cantharis collaris, Thunb. Dissert. iii. p. 203[3].
Hedybius collaris, Er. Entomographien, p. 95 (♂ ♀) (1840)[4].
Attalus rugipennis, Ab. de Perrin, Rev. d'Ent. xix. pp. 164, 174 (♀) (1900)[5].
? *Philhedonus rugulosus*, Gorh. P.Z.S. 1905, ii. p. 278 (♂ ♀)[6].
Hedybius sp. ?, Dixey and Longstaff, Trans. Ent. Soc. Lond. 1907, p. 378[7].
? *Hedybius atripes*, Pic, Mélanges exot.-entom. xxv. p. 2 (1917)[8].

♂. Antennæ long, rather stout, sharply serrate; head (Pl. XIV. fig. 30) rather small, black, the space between the labrum and epistoma (=clypeus of Erichson) testaceous, the vertex with a very deep, smooth, transverse, somewhat oblique furrow on each side, the two furrows coalescent and extending forwards for a short distance at the middle, and each bordered anteriorly by a curved ridge; anterior tarsal joints 1 and 2 thickened, 2 extending over 3 above; prothorax short, with a black patch of variable extent on the anterior part of the disc.

♀. Antennæ short, rather slender, more feebly serrate; head about as broad as in ♂, slightly depressed in the middle; prothorax often wholly rufous.

Hab. S. Africa, Cape of Good Hope[1 3 4 8] (*type of Fabricius, in Mus. Brit.*), Lion's Head, Cape Town[5], Table Mt.[7], Dunbrody, Willowmore[6], Ceres, Camps Bay, Port Elizabeth, Grahamstown, Giftsberg, Saldanha Bay, Klipfontein, Johannesburg, &c.

A common S. African insect, the very long series examined including the types (♀ ♀) of *C. aulica* and *A. rugipennis*, two specimens (♀) of *P. rugulosus* from Willowmore, and numerous examples (♂ ♀) recently captured by Mr. R. E. Turner in Cape Colony. Gorham described the anterior tarsi of the ♂ of *P. rugulosus* as 4-jointed, possibly owing to the third joint being concealed beneath the superiorly-elongated second joint; his description of the head and antennæ of that sex apply exactly to the species before me. *A. rugipennis*, type ♀, has the prothorax wholly reddish, as in some of the females from Saldanha Bay, Lion's Hill, and Table Mt. A metallic blue or greenish insect, with black antennæ (the three basal joints in part excepted) and legs, a partly or wholly rufescent, short prothorax, and closely punctate, tuberculate elytra, the elytra much widened posteriorly, with abundant silvery, subfasciately-arranged pubescence, intermixed with erect blackish-bristly hairs. The head in the ♂ is small, compared with that of the allied forms.

35. *Hedybius* (?) *sericeus*.

Philhedonus sericeus, Gorh. P. Z. S. 1905, ii. p. 277 (♀)[1].

Hab. S. Africa, Bothaville, Orange River Colony[1] (*Dr. Brauns*: *Mus. Cape Town*, *Mus. Brit.*), Pretoria (*Mus. Brit.*), Klerkadorp (*E. G. Alston, in Mus. Cape Town*).

Of this species I have seen seven examples: two from Bothaville, two from Pretoria, and three from Klerkadorp, all ♀ ♀.

A rather broad, shining, cinereo-pubescent, cæruleous insect, with a strongly transverse, red prothorax (a narrow scutiform or wedge-shaped mark in the middle in front excepted, this being obsolete in one of the specimens before me), and black antennæ (the testaceous lower surface of joints 1–3 excepted) and legs; the elytra closely, finely punctate; the antennæ short, rather stout, serrate. *P. sericeus* is almost certainly congeneric with *Hedybius aulicus*, F., and it is therefore provisionally transferred to the same genus.

36. *Hedybius* (?) *rufiventris*, sp. n.

♀. Elongate, much widened posteriorly, shining, thickly clothed with whitish pubescence intermixed with long, erect, blackish hairs; nigro-cæruleous, the prothorax and abdomen rufous, the antennæ (the testaceous outer edge of joints 1–4 excepted) and legs black; the head and prothorax sparsely, minutely, the elytra densely, finely, rugulosely punctate, the elytra with an indication of raised lines on the disc. Head narrower than the prothorax, with an oval convex space in the middle between the eyes; antennæ rather short, stout, sharply serrate. Prothorax moderately transverse, convex, rounded at the sides, obliquely narrowed posteriorly, the margins narrowly reflexed. Elytra at the base much wider than the prothorax, rapidly widening to near the apex. Legs hairy.

Length 4 mm.

Hab. E. AFRICA, Mt. Kokanjero, S.W. of Elgon, Uganda Protectorate (*S. A. Neave*: viii. 1911).

One example. Very like the S. African *H.* (*Philhedonus*) *sericeus*, Gorh. (♀ only of which is known), and separable from it by the less transverse prothorax, the sharply serrate antennæ, and the red abdomen.

37. *Hedybius diversipennis.*

Hedybius diversipennis, Pic, L'Echange, xxiii. p. 181 (♂) (1907).

♂. Tête large, rouge en avant noire en arrière, fortement creusée et munie au milieu d'une épine (foncée en dessus) et en avant d'un appendice avee 4 gibbosités dentiformes; antennes assez courtes, diminués à l'extrémité, noires avec articules 1–3 rouges le premier épais. [*Pic.*]

♀. Head rugose, rufous, black at the base, flattened, depressed in the middle in front; abdomen red, the terminal one or two dorsal segments nigro-maculate.

Hab. RHODESIA, Plumtree (*type of Pic*: ♂), Empandeni (*Mus. Cape Town*: ♀).

A robust, shining, pilose, rufescent insect, with the base of the head, the metasternum, the femora in part, and the pygidium in the ♀, black, and the elytra each with two blue or violaceous patches—one basal, excised behind, the other subapical, both nearly or quite reaching the suture,—and the elytra themselves as coarsely punctured as in *Illops corniculatus*, Er. Dr. Péringuey has sent me two females of it for determination.

38. *Hedybius quadripustulatus*, sp. n.

♀. Elongate, widened posteriorly, shining, thickly clothed with pallid pubescence intermixed with long, erect, soft, yellowish hairs; flavo-testaceous, the eyes, a small oblique streak on each side of the head at the extreme base, an elongate, scutiform patch on the disc of the prothorax (not reaching the base), the scutellum, a transverse patch on the pygidium, and the metasternum black; the elytra each with two large fusco-cæruleous spots—one basal, subtriangular, reaching the scutellum and inner margin, the other larger, oblique, not reaching the suture, subapical; the head and prothorax very minutely punctulate, the elytra closely, distinctly punctured. Head rather broad, narrower than the prothorax; antennæ short, comparatively slender. Prothorax strongly transverse, rounded at the sides. Elytra moderately long, incompletely covering the abdomen, the nigro-maculate pygidium thus being very conspicuous.

Length 5 mm.

Hab. W. Rhodesia, Kafue River (*J. Drury, in Mus. Cape Town*).

One ♀, captured in 1906. Larger, broader, and more robust than *H. simoni*, Ab., the type of which (♂) is before me, the latter having an immaculate head and prothorax and cæruleo-bifasciate (basal and apical) elytra. The bifasciate variety of *H. deliquescens* (No. 22) is also not unlike the present insect. The elytral markings resemble those of various species of *Urodactylus*, Thoms. (=*Mixis*, Ab.). *H. diversipennis*, Pic, is a larger insect, with coarsely punctured elytra.

39. *Hedybius simoni.*

♂. *Hedybius simoni*, Ab. de Perin, Rev. d'Ent. xix. pp. 164, 171 (1900).

♂. Antennæ moderately long, rather stout, serrate; head (Pl. XIV. fig. 31) short, nearly as wide as the prothorax, with a V-shaped furrow between the eyes (the central area appearing triangularly raised), limited on each side posteriorly by a transverse tumid space; prothorax deeply, transversely excavate on the disc in front, the anterior margin subangularly produced and obsoletely tuberculate in the middle; anterior tarsal joint 2 raised above the base of 3, black at the tip.

Hab. S. Africa, Makapan, N.E. of the Transvaal, province of Zoutpansberg (*E. Simon*).

The unique type of this insect has been lent me by Dr. Péringuey. It is a small (length 3 mm.), testaceous form, with a broad basal and apical fascia on the elytra and the metasternum cæruleous, the terminal joints of the antennæ infuscate. The general coloration is very like that of various species of *Urodactylus*, Thoms. (=*Mixis*, Ab.), and of *Philhedonus* (*Anthocomus*) *felix*, Gorh.

40. *Hedybius erichsoni.*

♀. *Malachius erichsoni*, Boh. Ins. Caffraria, i. p. 459 (1851).

♀. Elongate, robust, widened posteriorly, shining, clothed with fine scattered pubescence intermixed with numerous long, erect, blackish, bristly hairs; nigro-cæruleous or violaceous, the elytra each with a broad, outwardly-dilated, antemedian, orange-red fascia (not reaching the suture, but extending to the outer margin), the antennæ and legs black or metallic; the head and prothorax very sparsely, finely (at the sides more coarsely), the elytra coarsely, closely, rugulosely punctate. Head short, narrower than the prothorax, deeply, transversely excavate anteriorly; antennæ moderately long, rather stout, tapering. Prothorax strongly transverse, rounded at the sides, obliquely narrowed posteriorly. Elytra at the base slightly broader than the prothorax.

♂. Antennæ longer and stouter, rapidly tapering from joint 4 onward, 1–3 testaceous beneath, 3–5 oblongo-quadrate, 3 a little longer and wider than 4; head (Pl. XIV. fig. 32) with two stout conical tubercles between the eyes, and a very deep, large, trapezoidal excavation in front of this, in the centre of which is a horn-like prominence, the excavation extending to the vertical anterior margin of the epistoma; eyes convex and more prominent; anterior tarsal joints 1 and 2 thickened, 2 extending to beyond the middle of 3 above.

Length 4–5½ mm. (♂ ♀.)

Hab. S. Africa, Pretoria (*Mus. Brit.*: ♂ ♀), Shiluwane, Potchefstrom (*Mus. Cape Town*: ♂ ♀), Salisbury (*Dr. G. A. K. Marshall, Mus. Cape Town*), River Gariep (*type of Boheman*), Zambesi and Transvaal (*ex coll. Fry*).

Redescribed from 2 ♂ ♂ and 12 ♀ ♀. This insect is coloured like the much smaller *H. maculifer*, Ab. (=*bimaculatus*, Boh., nec Er.), the ♂ of which has simple anterior tarsi, short antennæ, and a non-tuberculate head. The elytral puncturing is coarse. The ♂-cephalic cavity is shaped as in *H. 4-guttatus*, Thunb., except that it is not continued backward on each side. A co-type (♀) has been lent me by Dr. Sjöstedt.

41. *Hedybius quadriguttatus.*

Cantharis quadriguttata, Thunb. Dissert. iii. p. 205 (1801)[1].
Hedybius quadriguttatus, Pic, L'Echange, xxvii. p. 157 (♂) (1911)[2].

"Thorace flavo macula nigra, elytris violaceis maculis quatuor albidis.... Tota violaceo-nigra, exceptis antennis, thoracis margine et maculis elytrorum albidis. Thorax orbiculatus, marginatus. Elytra singula in medio et apice notantur macula majuscula albida." [*Thunberg.*]

♂. Antennæ long, stout, tapering outwards, black, joints 1–4 testaceous beneath, 3 and 4 equal in length, 5–10 elongate-triangular; head (Pl. XIV. figs. 33, 33 *a*) bluish-black, nearly as wide as the prothorax, with a very deep, eroded, trapezoidal excavation between the eyes, and a deep oblique furrow on each side behind them, the lateral furrows preceded by a vertical, dentiform, supra-ocular prominence, and limited behind by a sharp oblique ridge, the vertex also angularly raised and subfasciculate in the middle; prothorax convex and produced in the middle anteriorly, closely punctulate, with strongly reflexed margins, black, the lateral and basal margins broadly rufo-testaceous; elytra moderately long, parallel, transversely rugulose and finely, densely punctate, cyaneo-violaceous, with a transverse whitish mark at the middle of the disc and a larger flavous patch at the apex; legs and under surface nigro-cyaneous, the anterior tarsal joints 1 and 2 thickened, testaceous.

Length 4 mm.

Hab. S. Africa, Cape of Good Hope[1 2] (*type of Thunberg*), Umvoti, Natal (*Mus. Cape Town*).

The above description is taken from a ♂ communicated by Dr. Péringuey. Pic[2] also has given an account of this insect, but he does not allude to the colour of the prothorax. The sides of the head are deeply, obliquely sulcate on each side, as in the ♂ of *H. marshalli.* Figs. 33, 33 *a* (Pl. XIV.) show the head from above and in profile.

42. *Hedybius flavocinctus*, sp. n.

♀. Moderately elongate, shining, finely pubescent, without longer hairs intermixed; nigro-cæruleous or black, the basal margin of the prothorax, and the basal joints of the antennæ beneath or in part (1 black above), testaceous, the elytra violaceous or blue, each with a narrow, oblique, sinuate, flavous median fascia not quite reaching the suture or outer margin; the head and prothorax sparsely, minutely, the elytra densely, finely punctate. Head much narrower than the prothorax; antennæ moderately long, feebly serrate. Prothorax transverse, convex, rounded at the sides. Elytra widened posteriorly.

♂. Antennæ much longer, rather stout, strongly serrate; head (Pl. XIV. fig. 34) wider, transversely excavate above, and with a smooth fovea on each side behind the eyes, the excavation bituberculate within, its anterior margin deeply trisinuate and also tuberculate in the middle; prothorax very broad, transversely subquadrate, nodose near each hind angle; elytra subparallel, about as broad as the prothorax, with a prominent, oblique humeral carina; anterior tarsal joints 1 and 2 slightly thickened, 2 raised above the base of 3.

Length 2½–3 mm. (♂ ♀.)

Hab. S. Africa, Darling, Cape Colony (*L. Péringuey, in Mus. Cape Town*: x. 1905).

One male, five females. A very peculiar, isolated form, provisionally included under *Hedybius*, the ♀ having the facies of a typical *Attalus*, the ♂ with remarkable characters.

PHILHEDONUS.

Philhedonus, Gorham, Ann. & Mag. Nat. Hist. (7) v. p. 82 (1900) [type *P. coronatus*, Gorh.].
Hedybiocephalus, Pic, L'Echange, xix. p. 144 (1903).

These genera are each based upon a single species with 4-jointed anterior tarsi in ♂, Pic's type having a broader head and angulate sides to the prothorax in the same sex, characters insufficient for generic separation, similar specific differences occurring amongst the numerous *Hedybii* *.

1. *Philhedonus coronatus.*

Philhedonus coronatus, Gorh. Ann. & Mag. Nat. Hist. (7) v. p. 82 (♂ ♀) (1900) (nec Fairm.).

♂. Antennæ short (as in ♀), rather stout, moderately serrate; head (Pl. XIV. fig. 35) much narrower than the prothorax, flattened, rugulose, opaque, with four arcuately-arranged, compressed tubercles extending across the vertex; prothorax angularly produced in the centre in front, and there furnished with an erect, matted, dentiform tuft of hairs; anterior tarsi 4-jointed, 1 and 2 long, 2 simple.

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* There is another allied monotypic S. African Malachiid genus with 4-jointed anterior tarsi in ♂—*Colpometopus*, Ab., type *pithecus*, Ab. (1900) (= *Troglops bussicornis*, Fairm., 1894),—but this insect has the head and antennæ differently formed, an apterous ♀, &c.

Hab. RHODESIA, Salisbury.

Seven males and two females seen. A robust, elongate insect, with the head, antennæ (the testaceous basal joints excepted), legs, and under surface black; the prothorax red, a transverse black patch or two spots on the disc excepted; the elytra long, widened behind, blue or bluish-green, finely punctured, pilose; the antennæ short in both sexes. The head and prothorax are relatively smaller than in the similarly coloured *Hedybii*. Gorham suggests that the angular anterior production of the ♂ prothorax is a stridulating-organ, but this cannot be the case.

2. *Philhedonus natalicus*, sp. n.

♂. Moderately elongate, much widened posteriorly, the head dull, the prothorax opaque, the elytra shining, clothed with fine pubescence intermixed with long hairs; black, the antennæ in part, prothorax, and anterior legs (the bases of the femora excepted) testaceous or rufo-testaceous; the head closely, minutely, the elytra finely and rather sparsely, punctured, the prothorax almost smooth. Head (Pl. XIV. fig. 36) short, narrower than the prothorax, flattened and uneven between the eyes, the vertex transversely sinuato-excavate, the groove limited anteriorly by an angulate ridge, which is triangularly produced backward in the centre; antennæ short, rather stout, subserrate. Prothorax transverse, rounded at the sides, convex, angularly extended forward in the middle in front. Elytra comparatively short, depressed on the disc below the base. Anterior tarsi 4-jointed.

♀. Antennæ shorter and more slender; head and prothorax shining, the former smoother and simply flattened, the latter not produced in the middle in front.

Length 3½–4 mm. (♂ ♀.)

Hab. NATAL, Malvern (*Mus. Cape Town*).

One pair. Much smaller and less elongate than *P. coronatus*, Gorh., the head of the ♂ simply angulato-carinate and excavate on the vertex, without tubercles, the prothorax immaculate, the elytra rather short, more finely punctured, the anterior legs in great part testaceous. The opaque surface of the prothorax of ♂ may be due to immaturity.

3. *Philhedonus coriaceus.*

♀. *Hedybius coriaceus*, Er. Entomographien, p. 95 (1840)[1].
♀. *Hedybius coriaceus*, var. *obscuritarsis*, Pic, L'Echange, xxvii. p. 157 (1911)[2].

♂. Elongate, widened posteriorly, shining, clothed with fine whitish pubescence intermixed on the elytra with long, erect, black hairs; head (except two very small spots in front in one specimen and the black basal portion, the latter sharply defined and trisinuate anteriorly), antennæ (except joints 6–11, which are black), prothorax (except a very broad, large, transversely-cordate, black space in front, not quite reaching the anterior margin), and legs (the. tarsi in part excepted) testaceous, the scutellum and elytra cæruleo- or cupreo-violaceous, the metasternum and abdomen green. Head (Pl. XIV. fig. 37) broad, the testaceous anterior portion flattened, subopaque, closely punctulate, the black basal portion limited in front by a trisinuate ridge; the vertex with a Λ-shaped, concave area in the centre, the space on each side of this somewhat depressed; antennæ rather slender, moderately long, joints 6–10 elongate-triangular. Prothorax broad, as wide as the head and the basal portion of the elytra, rounded at the sides, much narrowed behind; very sparsely, minutely punctate, with a matted tuft of long, curled, erect hairs in the centre in front. Elytra more or less uneven, rugulosely punctate. Pygidium bidentate at the tip. Anterior tarsi 4-jointed, 1 and 2 thickened, long.

♀. Antennæ shorter and more slender, the basal joints somtimes nigro-lineate above; head simply flattened; prothorax with a similar transverse black space on the disc anteriorly, which is biramose behind in one specimen; intermediate tibiæ and tarsi (or the tarsi alone), and the posterior legs wholly or in part, black.

Length 4–5½ mm. (♂ ♀.)

Hab. S. Africa, Cape of Good Hope[1] (*type of Erichson*: ♀), Willowmore, Saldanha Bay, Cape Town, Clanwilliam, Bechuanaland, Garies (*Mus. Cape Town*); E. Africa[2].

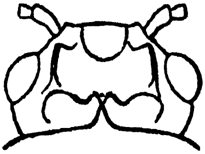
Three ♂ ♂ captured by Dr. Brauns at Willowmore are referred to this species. The numerous ♀ ♀ seen vary greatly *inter se* (three of these having very uneven, sparsely punctured elytra), but some of them agree well with Erichson's description of that sex, these specimens having the posterior legs black. The head, when partly withdrawn, appears to have two black patches at the base in both sexes.

The prothoracic tuft of the ♂ resembles that of *Hedybius hirtus*, F. The ♀ may be known from that of *Hedybius sculptilis*, Gorh., by the narrower fifth antennal joint and the less transverse prothorax.

4. *Philhedonus caffraricus*, sp. n.

♂. Elongate, widened posteriorly, shining, cinereo-pubescent, with longer blackish erect hairs intermixed; black, the oral organs in part, a transverse space on the epistoma, joints 1–4 of the antennæ (a streak on 1 excepted), the prothorax, and abdomen (a patch at the apex of the pygidium excepted) testaceous, the elytra nigro-violaceous; the head and prothorax very sparsely, minutely, the elytra somewhat closely, finely punctate. Head (text-fig. 3) narrower than the prothorax, with a smooth, deep, transverse, interocular excavation, which is limited in front by the short, convex epistoma, laterally by an angular ridge, and posteriorly by a prominent, transverse, mesially-interrupted carina, the vertex also transversely excavate behind this, the cavity divided by a short median carina; antennæ moderately long, sharply serrate. Prothorax convex, transverse, rounded at the sides, much narrowed behind, depressed in the middle in front; the anterior margin triangularly raised in the centre, and with a pallid, acute, dentiform process arising from beneath the central prominence. Elytra moderately long, wider than the prothorax. Anterior tarsi simple, 4-jointed.

Fig. 3.



Head of *Philhedonus caffraricus*, ♂.

Length 4 mm.

Hab. Caffraria (*ex coll. Sharp*).

One ♂, from an old collection. This insect is nearly related to *P.* (*Hedybius*) *coriaceus*, Er., the ♂ of which has a very differently shaped head and prothorax, a metallic abdomen, &c.

5. *Philhedonus fossulifer.*

♂. *Hedybiocephalus fossulifer*, Pic, L'Echange, xix. p. 144 (1903).

♂. Head (Pl. XIV. fig. 38) large, broad, flattened, with a compressed angular prominence in the centre of the vertex and four transversely-placed, equidistant foveæ in a line with the posterior margin of the eyes; antennæ rather short, serrate, tapering outwards, joint 1 above and the apices of 6–11 sharply nigro-maculate; prothorax broad, angulate laterally, and angularly raised and feebly dentate in the centre in front.

Hab. S. Africa, Dunbrody, Uitenhage, Cape Colony (*O'Neil*: *Mus. Brit.*; *Mus. Cape Town*; *Mus. Durban*).

I have seen fifteen examples of this species, all males. An opaque (the somewhat shining elytra excepted), closely cinereo-pubescent, black insect, with the anterior portion of the head, the antennæ in part, the prothorax (a broad oblongo-quadrate median patch excepted), and sometimes the anterior or intermediate tibiæ and tarsi in part, testaceous.

6. *Philhedonus felix.*

Anthocomus felix, Gorh. Ann. & Mag. Nat. Hist. (7) vii. p. 357 (♂ ♀) (1901).

♂. Antennæ rather short, stout, serrate; head (Pl. XIV. fig. 39) testaceous, black at the base, transversely depressed on the vertex, and with a V-shaped, laterally-prominent carina between the eyes, the carina obliquely grooved on each side behind, the front longitudinally bi-impressed; prothorax with a large triangular or scutiform black patch on the anterior part of the disc, deeply, transversely foveate in the centre in front, and with a triangular, erect prominence arising from the middle of the anterior margin; terminal dorsal segment of abdomen constricted and tubulate at the apex, emarginate at the tip, a pair of long, slender, hook-like processes projecting beneath it; anterior tarsi simple, 4-jointed.

♀. Antennæ shorter and more slender; prothorax with the black patch on the disc reduced to a narrow line or altogether wanting; pygidium testaceous, as in ♂.

Hab. Rhodesia, Salisbury.

Three ♂ ♂ and two ♀ ♀ seen. Gorham noticed the absence of the overlapping anterior tarsal joint in the ♂ of this species, but he failed to observe that the tarsi themselves were 4-jointed, and that the species really belonged to his own genus *Philhedonus*, described during the previous year. The ♂-prothoracic prominence was also overlooked. A small form not unlike *Hedybius simoni*, Ab., in great part testaceous above, the elytra with the base and a large subapical patch on the disc nigro-violaceous, the legs variable in colour in the male.

Alphabetical numbered list of species of Illops, Hedybius, *and* Philhedonus *enumerated in the present paper; those without generic indication belong to* Hedybius, *and those marked with an asterisk are described as new.*

*acanthopygus, 33.
albipennis, 7.
amœnus, 18.
aulicus, 34.
billbergi, 8.
bimaculatus, Er., 19.
*braunsi, 23.
*caffraricus (Philhedonus), 4.
clypeolus, 12.
coriaceus (Philhedonus), 3.
corniculatus (Illops), 1.
coronatus, Gorh.(Philhedonus), 7.
*cucullatus, 32.
*curvidens, 16.
*deliquescens, 22.
dentatithorax, 17.
*dentiger (Illops), 2.
diversipennis, 37.
*duplocinctus (Illops), 3.
erichsoni, 40.
erosus, 27.
felix (Philhedonus), 6.
*flavinasus, 10.
*flavocinctus, 42.
formosus, 8.
fossulifer (Philhedonus), 5.
*hamatipygus, 31.
hirtus, 1.
*kabetensis, 29.
*lamelliger, 13.
*lineaticornis, 21.
lividus, 6.
longicoxis, 28.
maculifer, 9.
marshalli, 15.
*natalicus (Philhedonus), 2.
plagiocephalus, 25.
*plicatilis, 14.
quadricornis, 20.
quadriguttatus, 41.
*quadripustulatus, 38.
*rufiventris, 36.
sculpticeps, 24.
sericeus, 35.
simoni, 39.
smaragdulus, 4.
*sulcipygus, 30.
superciliosus, 26.
*trilobatus, 11.
varicornis, 5.
*verrucosus, 2.

SYNONYMS, VARIETIES, ETC.
anceps, 26.
atripes, 34.
atropygus, 18.
bi-interruptus, 8.
bimaculatus, Boh., 9.
collaris, 34.
coronatus, Fairm., 12.
elongatus, 3.
fasciculatus, 5.
inarmatus, 15.
lætus (Illops), 1.
longicoccyx, 28.
luteonotatus, 3.
maculicornis, 19.
multimaculatus, 27.
obscuritarsis (Philhedonus), 3.
oculatus, 1.
prænotatus, 20.
pygidialis, 26.
quadrimaculatus, 1.
rugipennis, 34.
rugulosus, 34.
simplicifrons, 1.
sycophanta, 27.
trabeatus (Illops), 1.

EXPLANATION OF PLATES XIII. & XIV.

The figures, except those of the antennæ, give an enlarged view of the head and anterior margin of the prothorax, from above, the head in some cases being also shown from in front (figs. 11 *a*, 15 *a*) or in profile (figs. 19 *a*, 33 *a*). They are all diagrammatic, it being impossible to indicate the complicated structure in one figure. The antennæ are shown from above, 16 *a* from beneath. The explanation of the figures of the species illustrated on the two Plates is given under each insect in the text. All are taken from ♂♂.

XLIX.—*On the Discovery of the missing Type-Specimen of the Ascidian* Oculinaria australis, *Gray*. By R. KIRKPATRICK.

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THE type—and, until 1918, the only known specimen—of *Oculinaria australis*, Gray, has been missing for over fifty years. The unique specimen, preserved in spirit, was presented to the British Museum (Nat. Hist.) by Dr. Bowerbank, and was described by Gray in 1868 (P. Z. S. 1868, p. 564), a text-figure of only a portion being given. Gray's description is as follows:—"The mass is cylindrical, about 8 inches long and 1½ inch in diameter in spirits. It is white, with ends rather tapering and rounded. It entirely consists of a large number of more or less oblong cysts, placed closely side by side on every side of an imaginary central axis, the cysts covering the ends of the mass like the rest of the body. The cysts are hard, cartilaginous, rather convex externally, with two concavities having an opening at the base of each. . . . The outer surface of the cyst is covered with a thick hard skin, strengthened externally with embedded particles of sand. . . ."

Nothing more was heard of *Oculinaria* till 1886, when Herdman* placed the genus in his family Polystyelidæ; but, when examining the Tunicata in the British Museum, he was unable to see the type of *O. australis*, because it could not be found.

Later, Michaelsen and Hartmeyer had wished to see this specimen in order to gain some knowledge of the affinities of the genus; but they, also, were disappointed. Gray's diagnosis was wholly based on external characters, and no clue whatever had been given concerning the essential features.

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* 'Challenger' Tunicata, part ii. p. 323.

In 1905, during the Hamburg South-west Australian Expedition, Hartmeyer and Michaelsen collected near Fremantle a number of specimens which appeared to have all the characters of *Oculinaria australis*. The specimens had been cast ashore after a storm, and evidently had been torn up from the sea-bottom. A curious fact now became revealed, viz., that elongated digitiform examples possessed not an imaginary axis, but a solid one formed by a filament of alga.

In 1918 Hartmeyer published a short preliminary account of the Ascidian*, giving a description of the internal anatomy.

The genus has certain unique characters, which readily distinguish it from all the other members of the subfamily Polyzoinæ—for *Oculinaria* alone has four folds in the branchial sac, all the rest of the genera of Polyzoinæ having less than four. Further, the gonads are on one side only, viz., on the right side.

To return to the missing type-specimen. When, in 1895, the writer was entrusted by Mr. E. A. Smith with the charge of the British Museum collection of Tunicata, he made a manuscript catalogue. A prolonged but futile search was made for the type-specimen of *Oculinaria australis*, firstly among the Tunicata and less thoroughly among the Anthozoa.

Recently Mr. A. K. Totton has had a preliminary card-index made of the Anthozoa, and the writer asked him if by any chance the name *Oculinaria* had been entered. Happily the name was found, and presently the long-lost type was produced. Probably the specimen had been misplaced at the time of the removal of the Natural History collections from Bloomsbury to South Kensington in 1880. It was not surprising the writer had overlooked the specimen in 1895. Not only had it been placed amongst an alien group in a high dark cupboard, but the original description was incorrect and misleading—probably owing to a printer's error. For Gray records the diameter as 1¼ inch (33 mm.), but the correct figure should be less than ½ inch (12 mm.). Hartmeyer had already arrived at the conclusion that a mistake had been made here. The length is 8 inches, but the slender specimen had been doubled up and pressed into a small bottle less than an inch in diameter and only 6 inches high. The writer was looking for a tough stout specimen 8 inches high and 1⅛ inch thick.

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* "Eine wiedergefundene Ascidie," SB. Ges. naturf. Berlin, 1918, no. 10, p. 385.

Gray had not noticed that at one of the tapering and rounded ends there was a contracted opening with well-defined margins that could easily be stretched several millimetres.

The writer failed to find the axial stem of sea-weed; but there can hardly be any doubt that it has existed, and possibly it still exists, but there is no need to mutilate the specimen to find it.

A dissection of one of the polyps showed four folds in the branchial sac, and gonads only on the right side of the body. (The writer only found two gonads, but one may have been lost in removing the ascidiozooid from the very tough test.) Accordingly, Hartmeyer's identification of his specimens collected near Fremantle is fully confirmed by comparison with the recovered type.

L.—*On the Anatomy of some new Species of* Drawida. By C. R. Narayana Rao, M.A., University of Mysore, Bangalore.

[Plates XV.-XVIII.]

The adult anatomy of this genus of Oligochæte worms is now fairly well established, especially by the investigations of authors like Beddard, Benham, Bourne, Michaelsen, Perrier, Rosa, and Stephenson. The present communication deals with certain glands associated with the reproductive apparatus of some new species of *Drawida* not hitherto recorded so far as I am aware. The material at my disposal has been a large collection of well-preserved worms collected towards the middle of 1918 in the rain-forests of Coorg, at elevations ranging from 2500 feet to 4000 feet. I do not propose to add any remarks on the known species contained in my collection, but will select for discussion the forms hitherto undescribed. I have received from Dr. Stephenson and Dr. Michaelsen, copies of their excellent papers relating chiefly to those forms occurring in Ceylon and the Indian Empire, and my thanks are due to them and also to Dr. N. Annandale, who courteously permitted me in June 1919 to examine the named collection of the Oligochæte worms belonging to the Zoological Survey of India.

Dr. Michaelsen, in his memoir on the Oligochæta of the Indian Empire and Ceylon, remarks that S. India and Ceylon are the proper home of the genus *Drawida*, and perhaps the whole forest-clad elevated portion of western India and Ceylon is its principal original habitat. In the months of March and April, before the heavy showers descend, the heat in this area is intolerable, and several species of *Drawida*, perhaps meeting a rock or some other impenetrable surface while burrowing deep down to escape the dry heat, come out and perish in numbers all along the jungle foot-paths. The immense thickening of the anterior body-wall and the septa in all the species described in this paper, and the provision for the storage of water in the anterior nephridia (salivary glands) and the appendages of the alimentary canal, must be closely correlated with the conditions of life to which they are exposed. When a specimen is put on a sheet of blotting-paper, it goes on depositing drops of fluid exuding from the mouth as it explores, and a few drops of such a fluid under the microscope reveal cellular debris and corpuscles of the cœlomic fluid. The mode of transmission of water from one segment to the other must be partly by percolation through septal crevices and partly by rapid cellular absorption, aided by the contraction of the specially large transverse muscles in the genital and anterior somites. The conspicuous development of these circular muscles and the enteric appendages are purely a secondary adaptation, and may vary in individuals of the same species differently situated.

Drawida somavarpatana, sp. n.

External Characters.—Length of spirit-specimens, 80 to 95 mm.; fully stretched live ones, 100 to 105 mm.; maximum diameter in the preclitellar region, 5 mm.; at about middle of body, 3·5 to 4 mm. Number of segments 80 to 90: no secondary annulations.

Colour, deep blue or almost black in the living condition. Spirit-specimens grey with blue on the anterior somites.

Prostomium prolobous; dorsal pores absent. Setæ very small and closely paired; *aa* equals *bc*; *d* is on the midlateral line of body in the postclitellar part and below this line anteriorly.

Nephridiopores large, placed on seta-line *d*; bases of setæ chiefly the ventral series surrounded by whitish sensory papillæ. The skin all along the line of nephridial apertures has a glandular thickening.

Clitellum well marked over 4½ segments (10, 11, 12, 13, and 14/2). In the living specimens the grey of the clitellum forms a striking contrast to the general blue background of the body; a very deeply marked glandular fold on the sides of segments 10 and 11 forming a sort of copulatory bracket round the genital orifices. Between these folds in the median line are more or less clearly defined oval elevated glandular swellings on somites 10, 11, and 12.

The genital area varies markedly in individuals of different degrees of sexual maturity. In the fully mature forms the region between the male apertures, *i. e.* the ventral part of somites 10 and 11, may be completely hollowed out and dark, which is occupied by glandular swellings in slightly less mature forms. It is noticed that in several large individuals the clitellar lateral folds on segments 10 and 11 are either feebly indicated or are not developed. It is in the fully mature forms that the clitellum itself extends over half of the segment 14, while in others only four segments are affected. The other grooves and depressions present on the ventral surface of the genital area must be due to the disproportionate clitellar thickenings.

The male aperture is a large transverse slit between segments 10 and 11, situated on spherical tumid elevations in the furrow on or slightly external to seta-line *b*. Female apertures between segments 11 and 12, inconspicuous, internal to seta-line *a*. The spermathecal orifice in furrow 7/8, not easily visible, in line with the male openings.

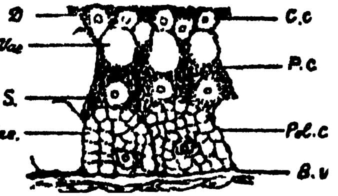
Internal Anatomy.—There are no septa between somites 1 and 2, and 2 and 3. Those between 3 and 4, 4 and 5 are fairly, and others (5 and 6, 6 and 7, 7 and 8, 8 and 9) considerably thick. In some specimens the septa 6/7, 7/8, and 8/9 are only as thick as the anterior ones.

The Muscular System.—The internal longitudinal muscles are tough, and are far more powerfully developed in the anterior somites, where they are iridescent. In somites 9 to 12 are laid additional innermost transverse bands of muscles such as are described in *D. robusta*, subsp. *indica* (Benham).

The œsophagus is a thin-walled narrow tube extending up to somite 13. Gizzards from 3 to 5 with softer annuli between them are placed in somites 14 to 21. The first gizzard is usually small and thin-walled. The alimentary canal is thin-walled, and bears dorsally finger-shaped appendages which commence from behind the last gizzard. These glandular structures, which we may term "enteric appendages," in the same position as the "lymph glands" of other worms like *Pheretima*, occur in most species of *Drawida* examined and described in this paper. Commencing from behind the last gizzard, there are a pair of these finger-shaped organs occurring in each segment in various degrees of development. A reference to these structures has rarely been made by previous authors, who have described about forty and odd species belonging to this genus. The mode of development of these organs is best studied in young worms, such as those of *D. paradoxa*, in which they occur in the middle and hinder portion of the intestine in an incipient stage. The dorsal muscle-fibres (Pl. XVI. fig. 4) of the alimentary canal, at the points where the glands are developing, are laid or become disposed like the ribs of a fan, and are comparatively shorter than the neighbouring fibres, which are certainly longer and are circularly disposed. In the middle of each of the former set of fibres a swelling takes place, due to the accumulation of lymph and lymph (cœlomic) corpuscles. At the point where these specialised muscle-fibres, which ultimately change their muscular character, converge on the inner border towards the dorsal vessel, there is a dense heaping up of cells proliferating from the peritoneum. From this source, these rapidly multiplying cells move outwards across the metamorphosing muscle-fibres, becoming at the same time incorporated with the cœlomocytes. The number of muscle-fibres affected at the beginning may be between 24 and 36, out of which about 6 to 12 may reach the final stages of glandular development, while the others are detectable in a state of arrested growth. A fully formed glandular process thus derived from a muscle-fibre may attain a size nearly over fifty times that of the latter. I could discover no peritoneal covering on the digitate processes or on the basal lobe, even in sectional preparations, and there is no other connection between these stuctures and the septa beyond a few muscle-fibres. Both morphologically and perhaps physiologically, too, these enteric appendages of the species of *Drawida* described here would appear to be distinct from the "lymph glands" of Schneider.

It is noteworthy that these structures are best developed in forms taken in places rather dry and exposed. Each of these appendages, looking white and disposed in the form of tubules, is attached to the dorsal vessel partly by its own connective tissue, but mainly by an arterial twig on either side. This is the principal source of blood-supply to them, and histologically they are mesoblastic in origin. When an entire appendage is cleared by acetic acid, and examined microscopically under the high power, more than two kinds of cells can be discovered. The marginal portions of the processes are fringed by fairly large club-shaped cells, not unlike the solenocytes of polychæte worms with perhaps similar functions. Broken and degenerate setæ are also found obviously in the process of elimination through the alimentary canal. The basal parts are occupied by large pyramidal and polygonal cells, with either a single large vacuole as in the former or numerous smaller vacuoles as in the latter case. The tapering portion of the pyramidal cells, which is also the region of vacuoles, extends into the peripheral portion of the appendage, while a fairly rich network of capillaries surrounds the basal tissue elements. The mode of elimination of setæ must be through the blood-vessels entering the alimentary canal, while the debris of waste matter also found in the appendages must be carried to the nephridia by the blood-vessels to be discharged outside. But their main function is probably to act as water-storing organs. When fresh specimens are examined, the large vacuoles present in the basal cells are seen to contain quantities of water, apparently imbibed in the heavy wet weather to be utilised during periods of more or less prolonged drought. These appendages are not, however, the only water-conserving organs. The anterior nephridia (Peptonephridia) in somites 3, 4, 5, which open into the pharynx and accordingly are deemed salivary glands, differ structurally in certain particulars from the segmental renal organs. In the main lobes of the former nephridia, in addition to the non-ciliated glandular wide tubes, we find other similar wide canals which follow a tortuous course, and

Text-fig. 1.



A portion of the enteric appendage mounted in glycerine.

C.c., club-shaped cells; *S.*, broken setæ; *P.c.*, pyramidal cells; *Pol.c.*, polygonal cells; *B.v.*, blood-vessel; *Vac.*, vacuoles; *D.*, organic debris.

the narrow ciliated tubules are considerably wider than in the nephridia of the hinder somites. The whole system of draining tubes is connected by fairly wide vertical canals and is a device for the rapid absorption and diffusion of fluids into the pharynx. It is doubtful whether, at least in this genus and others affecting the hotter countries, the term salivary gland used in certain text-books for the description of these nephridia, correctly denotes their function, which at any rate cannot be peptic. At least in the several species of *Drawida* which I have observed and examined, these structures would appear to be associated more with the function of collecting and discharging water through the mouth, both while feeding and burrowing, than with any digestive function.

In the species of *D. elegans* and *D. modesta* described below, the intestinal appendages, chiefly in the posterior somites, are greatly enlarged, while the blood-vessels going to them on either side, are also correspondingly elongated. Usually a supra-intestinal (? typhlosolar) vessel is found in these forms, and the appendages in such cases have a double connection with the vessels—one with the dorsal and the other with the supra-intestinal vessel. The enteric vessel is derived in an arbitrary manner, either directly from the longitudinal vessels or from the appendicular branch.

At the same time, these appendages in the several somites are more or less confined to one border of the branch-vessel, and developed in the form of separate lobes. It is hypothetically possible to derive the recently described septal nephridia of *Pheretima posthuma* from the enteric appendages of *Drawida*, and the only fact available at present in favour of such a hypothesis is the histological resemblance between the two structures. The excretory water-conserving organs of *Drawida* are certainly mesoblastic in origin, as is testified to by their cellular structure, and for a similar reason the septal nephridia also are of the same origin *. Moreover, there is not any histological difference between the septal organs of *Pheretima* and the meso-nephridia of genera like *Acanthodrilus*, *Perichæta*, *Megascolex*, *Notoscolex*, and other forms which I have investigated. The process of the evolution of septal nephridia may be illustrated as shown in text-fig. 2. I am disposed to believe that the suggestion of Dr. Woodland that the system of enteronephric tubules is a means of conserving water in tropical earthworms like *Pheretima* is the more correct interpretation of their function; for if these structures were concerned in the elimination of waste through the gut, as is presumed to be their function, then the chances of these waste particles being repicked up by the chloragogenic or yellow cells of the alimentary epithelium will have to be accounted for. The yellow cells are present in the gut-wall and typhlosole of the *Pheretima* quite as numerously as in the other examples of earthworms like *Perichæta* or *Megascolex*. More than this, the volume of the toxic products entering that part of the gut where the digestion and absorption of food take place must be so large, judging from the number of septal nephridia in *Pheretima*, that it is certainly doubtful whether these digestive processes occur without the ferments being destroyed. On these physiological bases alone, it may not be quite correct to ascribe to these "enteronephric" systems an excretory function. If, in addition to the histological affinity between the enteric appendages of *Drawida* and the enteronephridia of *Pheretima*, embryological evidence also is forthcoming, then there can be no doubt about their being an adaptation for the conservation of water.

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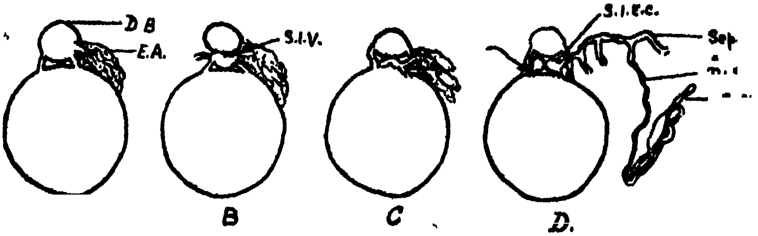
* 1919. N. F. Woodland, Q. J. M. Sci. n. s. vol. lxiv. part 1, p. 101. "But it seems to be evident that the septal nephridia of *Pheretima* certainly cannot be developed from ectoderm, but must be mesodermal in origin, since we can hardly suppose they are endodermal outgrowths.

Text-fig. 2



A shows the relation of dorsal blood-vessel (*D.B.*) and the appendage (*E.A.*). In **B** the relation of the supra-intestinal vessel (*S.I.V.*) and the appendage is shown. **C**, **D** are hypothetically derived from **B**. *n.d.*, nephridial duct, *S.N.*, septal nephridia; *Sep.c.*, septal canal; *S.I.E.C.*, supra-intestinal excretory canal.

Vascular System.—The last hearts are in segment 9 and the most anterior ones in segment 5. The dorsal vessel is thickest over the region of gizzards and is connected with the lateral longitudinal vessels by secondary vascular commissures in somites 9, 8, and 6. The lateral longitudinal vessels, whenever present in this species, rarely extend beyond somite 20. A supra-intestinal occasionally and a subneural vessel never present. Both the dorsal and ventral vessels are full of muscular fibres and the phenomenon of the walls of the heart becoming opaque on pouring spirit on freshly opened specimens, observed in *D. grandis*, Bourne, is shared by the dorsal vessel over the gizzards in this species and in *D. elegans*. The degree of development of vasa vasorum in the walls of the heart diminishes as we go forward and it is also present in the walls of the ventral vessel, which picks up opacity under the spirit, though to a less extent. I have been unable to discover any valves in the course of the principal vessels, and the internal endothelial layer in the dorsal and ventral trunks may be thrown into folds simulating a valve-like structure in the regions anterior to somites 10, where the mesenteries are thickest. It is also in this part of the body that the powerful muscular contractions, while burrowing or otherwise, are likely to reverse the course of the blood-flow, and hence the need for valve-like structures. The lumen of the arterial twigs going to the enteric appendages is partially divided longitudinally by a ridge-like elevation of the internal lining. This partial division perhaps represents an incipient stage in the morphological differentiation of the vessel into afferent and efferent ducts. The only other region where I have noticed a valve-like fold is the point where the enteric twigs are given off either directly from the longitudinal dorsal vessels or from the appendicular branches. The valves are simple folds of endothelium pointing towards the blood-flow. The lateral longitudinal vessel supplies branches to the anterior nephridia and all the reproductive organs and their associated glands. From the ventral vessel are derived branches for the nervous system, the body-wall, and the ventral walls of the intestine and the nephridia.

Nephridia.—I have only to add here that the vesicle described as occurring in *D. grandis*, Bourne, is not present in this and other species, except *D. paradoxa*, described in this paper, and the narrow ciliated tubules form complicated loops in the periphery of the lobes, which, however, can be easily made out from the plexuses of blood-capillaries. The vesicles in these species bear the same microscopic structure as the lobes, hence they are described as being absent as such. The glandular part is disposed in distinctive lobes, the enteric lobe lying on the sides of the intestine, the subenteric below the intestine, and the parietal projecting into the sides of the body-cavity. In the species of *Drawida* described in this paper and others[*] I have examined, I have noticed that the preseptal funnel (Pl. XVI. fig. 5 *a*) is slightly different in structure from that of *D. grandis*. The number of marginal cells is about 10, rarely more; the drain-pipe or centrifugal cells are absent. Their place is taken by a secondary funnel, placed at the bottom of the larger anterior one. This secondary funnel is composed of more or less cylindrical cells, placed transversely to the axis of the cavity of the funnel-tube. The cell-boundaries are not evident even in clarified preparations, and, judging from the number of nuclei which are placed more towards the inner border of the funnel, the cells themselves cannot be more than ten. Each cell is provided with a few stiff cilia, somewhat bent twice, stouter and shorter than those of the marginal cells. There is a distinct flange or outer rim round this smaller funnel, which, like the cells themselves, is full of granular cytoplasm. The funnel-tube is ciliated and has a tunic of cœlomic epithelium.

Reproductive System.—The ampullæ of the spermathecæ are fairly large spherical vesicles, lying dorsally, closely pressed against the dorsal vessel. Frequently they nestle in pouch-like excavations on the posterior face of septum 7/8, with an envelope of cœlomic epithelium. When rectified spirit is poured on freshly opened specimens, this sac changes its milk-white appearance into a pale yellow, and at the same time the outer epithelial covering becomes transparent. The duct is thin, much soiled, in its first course over the septum 7/8, and then becomes a fairly long wavy tube, which pierces the septum where it is inserted in the body-wall. From either end of the muscular atrial chamber arise two atrial diverticula[†] placed in segments 7 and 8. Each atrial or copulatory sac, slightly pinkish with a strong muscular shimmer, is a cylindrical long papilla, somewhat curved, and does not come into view till pulled out from below the œsophagus. In the fully mature worms the diverticula of one side meet their fellow of the opposite side in the mid-dorsal line.

Dr. Michaelsen, in his memoir on the Oligochæta of the Indian Empire and Ceylon (pp. 136–139), discusses, after a microscopical study of the ampulla and the tubular diverticula of the atrium of *Moniligaster perrieri*, the morphological

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[*] *D. pellucida*, Bourne, *D. chlorina*, Bourne, *D. ghatensis*, Mich., and *D. brunnea*, Stephen.

[†] Such atrial sacs have been recorded in *D. robusta* subsp. *ophidioides*, *D. robusta* subsp. *indica*, *D. minuta*, and *D. shankarai*. In *ophidioides* the pouches are of unequal size.

and functional significance of the different parts of the spermathecal apparatus of Moniligastridæ, and finally attempts to homologise them with those of the family Megascolicidæ. He sets forth his conclusion in the following terms:—"There can be doubt that the pear-shaped, long-stalked pouch in the seventh segment of the *Moniligaster perrieri*," as well as of all other Moniligastridæ, corresponds functionally with the diverticula of the Megascolecid spermatheca, being the magazine of sperm-masses received in the copulatory act. The atrial cavity, on the other hand, may act as a copulatory pouch, corresponding functionally with the muscular duct of the main pouch of the Megascolecid spermatheca, whilst in some species of *Moniligaster* a secretory function is added, being confined to special organs—the glandular branched tubes only in *Moniligaster*." It would require an examination of the spermathecal apparatus of almost every genus of the two families before one can confirm or disprove the view of Dr. Michaelsen. I have microscopically investigated the teased preparations and sections of every part of the spermatheca of the following species of *Drawida—D. pellucida, D. cholorina, D. brunnea*, and *D. ghatensis*, and all the five species described in this paper, which were all sexually mature,—and the results obtained do not confirm the view that the spermathecal atrial organs of the two foregoing families are functionally different, though homologous. First, as regards the ampulla, I must mention that in teased preparations and sections the cavity was found filled with a mucilaginous matter in all the species *, in which no sperms in any stage of development could be detected. This contained substance is easily dissolved by alcohol. In point of microscopic structure the ampulla is uniform in all the species, comprising an internal lining of large columnar glandular cells, which, on clearing by alcohol, shows in teased and sectional preparations granular cytoplasm heavily loaded with mucin and staining deeply (methylin-blue). The nucleus is large, and placed at the middle of the cells. The cavity of the ampulla is not uniform, being narrower at the end where the duct leads off. The glandular layer is invested by a muscular coat, with the fibres circularly disposed, and between it and the outer membranous covering in the cleared preparations and sections is a space filled with a deeply staining granular matter and a few corpuscles. The cells of the external covering are irregular in outline, and the cytoplasm is only sparsely granular, but mostly clear. This outer epithelium becomes membranous when the cell-layers are numerous, and a few connective-tissue fibres become incorporated into the structure. The ducts also were empty in all the species, and the epithelium of these tubes is composed of a lining of non-ciliated cubical cells, with granular cytoplasm and a centrally situated nucleus. The shimmer often noticeable in the ducts is due to the muscle-fibres, which are circularly disposed, rarely a few longitudinal fibres being present, and held together between the internal lining and the excessively thin external membrane (Pl. XVII. fig. 10 *a*).

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* Dr. Stephenson (Rec. Ind. Mus. 1917, vol. xiii p. 365), in his description of *D. kanarensis*, mentions that the spermathecal ampullæ "were filled with a shining white opaque mass, doubtless spermatozoa."

In the teased preparations of the atrium and the atrial pouches of these species (Pl. XVIII. figs. 10 *h*, 10 *i*), I could discover nothing, except in one individual out of four (*D. somavarpatana* subjected for examination), in which well-developed sperms were found in a mucilaginous base which clogged both the pouches. Dr. Michaelsen found, in his preparations of the ampulla and the atrial appendices of *Moniligaster*, fibrous and granular masses which he identified respectively as sperms and glandular secretions. He next proceeds to establish the functional differences between the ampulla and the copulatory vesicles of the two families Megascolecidæ and Moniligastridæ. From the observation I have recorded above, *i. e.*, that the copulatory appendices were full of sperms in one individual of *D. somavarpatana* and from histological considerations of the ampulla and the diverticula, it is quite possible to reach the opposite conclusion. In *D. ghatensis* the cavity of the atrial pouch is a trigonal chamber; in *D. somavarpatana* it is irregularly divided up into very minute recesses; in *D. elegans* it is a wide chamber, disposed in a spiral; in *D. brunnea* its surface bears a number of annular ridges; in *D. chlorina* the cavity is flask-shaped, and it is simply wide in *D. pellucida*, *D. modesta*, *D. scandens*, and *D. paradoxa*. In all these species the epithelial lining near the ectal ends of the pouches is composed of short cubical cells full of granular cytoplasm and a large nucleus, while in the ental end the cells tend to become syncytial and the cytoplasm is present only very poorly (Pl. XVIII. figs. 10 *f*, 10 *g*). The cell-walls have a strong tendency to become cornified and look like those of the epidermal layer. The muscle-fibres are circularly disposed in a thick layer, and the outer tunic in *D. somavarpatana* is distinctly a thin cuticular layer with little cellular structure. The main fact

I wish to point out here is that the structure of the copulary vesicles in the species of *Drawida* examined enables them to act as magazines of sperms received during copulation and for expelling them for fertilisation later. On hypothetical grounds, too, it is rather difficult to conceive the sperms working their way up all along the most tortuous course of the spermathecal duct, to be housed temporarily in ampulla, and to be returned through the same passage. On examining the material in my possession, I should not hesitate to adopt the view that the ampulla of *Drawida*, like that of the family Megascolicidæ, has a secretory function, while the atrium and its diverticula act as storing organs of sperms, besides aiding in copulation.

Testes and Sperm-sacs.—The most important feature of the male reproductive organs of this species to which I should call attention is the occurrence of two pairs of sperm-sacs, a fact not hitherto noticed in any of the numerous species already described. The first pair are very large, yellowish, massive, irregularly subspherical bodies suspended by the septum 8/9 (Pl. XV. fig. 3 *a*). They usually occupy segments 9, 10, 11, and 12, and are never constricted by the septal walls, which, however, are extremely thin in these somites. Frequently they leave their proper position and descend backwards up to segment 18, and wherever placed they repose on the œsophagus and are connected to the septum 8/9 by the drawn-out tubular extension of the wall of the mesentery, and in the succeeding segments they are invested with septal peritoneal outpushings. In somite 9 the œsophagus and other organs are contained in the cavity between the double wall of the thin septum 8/9, and this cavity of the mesenterial sac is continuous all round them. Each of the posterior or second pair of sperm-sacs is really a double, white, tubular vesicle with a velvety appearance. They lie in somite 10, having very early in development detached themselves from the septum 9/10. They are bent in the form of a query-mark, and usually lie hidden below the œsophagus, occupying segments 9 and 10. In one form, which has developed clitellum over 4½ segments, they are very long, and extend as far behind as segment 14. Rarely the tubular vesicles on the same side are unequal.

There are certain interesting facts connected with the microscopic structure of these two kinds of sperm-sacs (Pl. XVII. figs. 10 *a*, 10 *b*). A firm membrane, the mesentery of septum 8/9, encloses the anterior testis, and the rosette belonging to somite 9 and the lower hinder surface of the sacs is bevelled and bright yellow in appearance, which marks the position of testis. The outer membrane can be easily removed by an incision, and the contents are a large lobulated yellow testis, in close contact with the rosette of the sperm-duct and seminal cells in various stages of development, together with large oval cells surrounded by a rich vascular plexus. In the neighbourhood of the testis are bundles of muscle-fibres, which surround the mass of seminal cells, which thus obliterate the cavity of the sac. The sperm mother-cells and sperm morula lie outside the vascular plexuses, and they, however, are richly granular and contain a large centrally situated nucleus. In transverse sections of the sac the seminal cells appear to be more centrally placed, being surrounded by muscular fibres and a very thick mass of ovoid cells. The testis is seen attached to the anterior face of the sac just in front of the funnel, the details of whose cellular structure are better made out in teased preparations. The funnel is certainly a large opening, only a part of which is, however, in contact with the testis, while the seminal cells almost fill the other part of the funnel. The large oval cells, which proliferate from the inner surface of the sac, obviously act as unicellular organs for the storage of reserve food-material.

Though in point of size and form the testis-vesicles of somite 10 differ from the anterior ones, yet in point of histological structure there is absolute identity. The outer wall of the sac in the case of the tubular vesicles is excessively thin and almost non-cellular, and accordingly the large oval cells enclosed in vascular plexuses show through, giving the organs a smooth velvety appearance. If xylol is used for the clearing purposes, this cellular investment easily comes off on applying needles for teasing, and the testis in each lobe is seen to form a tubular structure. This tubular testis stands out, because of the investment of circularly disposed muscular fibres. At the point where the two testis-tubes open into the common rosette they become continuous, and in the sac they are disposed in the form of three ridges of large hexagonal cells. The cavity, which is trigonal, is filled with masses of sperms. The main point in the structure of these curious sperm-vesicles is that the cavity is lined by a layer of large spermatocytes, which almost become continuous with the funnel-like expansion of the vas deferens. There is no seminal funnel in somite 10 beyond the sac-wall of the testis, over the base of which, as we have noticed, the vas deferens is continued as a sort of outer tunic, which obviously represents the funnel. The sperm-duct belonging to somite 9 is long and lies in a secondary mesenterial tube. Each duct turns inwards and pierces the very thin septum 9/10, and runs below the parietal lobes of the nephridium and joins the spermiducal gland on its upper anterior margin, just at the point where the second seminal duct enters it. The latter is a shorter and thicker non-convolute tube. In microscopical structure they resemble one another, except for the fact that in the shorter duct belonging to somite 10 there is an envelope of circular muscle-fibres outside the cubical epithelium, which is, however, ciliated in the longer duct belonging to the anterior somite. In the funnel of the anterior sperm-duct, the cells are more columnar and also ciliate. The cytoplasm stains deeply, and the nucleus is large and centrally placed in the funnel-cells. There is a distinct, though very thin, peritoneal outer layer for the posterior sperm-duct, which is simply an upward extension of the outer layer of the spermiducal gland.

The prostate or spermiducal gland (Pl. XVIII. fig. 10*j*) is a comparatively small structure, spherical and yellowish, and the greater part of the atrium is buried in the body-wall. It has two sources of blood-supply, both from the subintestinal and lateral longitudinal vessels, and small branches extend on to the sperm-vesicles. There are the usual two kinds of club-shaped glandular cells, the large and small ones, in addition to the more spherical, also glandular, cells. The circular muscles are confined to the duct-like prolongations of the gland-cells. There is a peritoneal investment, and groups of cells are found near the necks of the glandular larger cells, and the differences between these fourth group of cells and the glandular cells in their contents are more clear, stain less easily, and the spherical small nucleus is very clear in them. The cubical epithelium of the atrium is more or less horny on its inner surface. The outer lips of the male atrial orifice are swollen and comprise a mass of smaller oval glandular cells, which occur in great uniformity over the whole clitellum and the copulatory brackets themselves, which are several layers deep. In addition to these smaller cells, there occur in equal abundance the more common flask-shaped cells. Almost as a rule, whatever may be the shape and size of these gland-cells the nucleus is pushed to one side of the cell-body, and this position of the nucleus becomes so pronounced that it may be used for distinguishing the epithelial cells with granular cytoplasm, in which the cells are more centrally situated.

The occurrence of two pairs of sperm-vesicles in *D. somavarpatna* is not without significance in this genus, although in other earthworms it is almost a normal feature. In discussing the phyletic relations of the different genera of the family Moniligastridæ, Dr. Michaelsen, who, in the description of the species *D. willsi*, known from the Central Provinces, Deccan (Hyderabad), and W. Himalayas, records "Häufig rudimentare Prostaten im 9 Segment," remarks "that this structure confirms the statement of Rosa (adopted by myself) that the genus *Drawida* has arisen from the holoandric genus *Desmogaster* by the loss of the first pair of male organs, as well as a dislocation of all the generative organs, with the exception of the spermatheca." Dislocation of the generative organ there certainly has been in *D. somavarpatana*, in so far as the anterior sperm-duct has lost a separate exit (in the intersegmental groove 9/10), and a portion of it lies in segment 10, where it opens into the spermiducal gland, but the disappearance of one of the pairs of male organs has not taken place. There can be no doubt as to which pairs of seminal vesicles of *Desmogaster* those of *Drawida* correspond, and, in order to homologise them, it is necessary to assume that in its evolution *Drawida* has arisen by the suppression of somites 8 and 9 in the archaic ancestral *Desmogaster*. In one individual of *D. somavarpatana* in my collection I notice a partial suppression of segment 8, and in the Oligochæta generally similar partial or total disappearance of somites is not uncommon as individual variations. Furthermore, the suppression of somites must have preceded the disappearance of one pair of seminal vesicles in the course of descent, as is evidenced by the anatomy of sexual apparatus of both *D. willsi* and *D. somavarpatana*. If the hypothesis of the suppression of somites 8 and 9 is correct, then the anterior pair of the spermatheca of *Desmogaster* correspond with those of *Drawida*, the last hearts (segment 11) of *Desmogaster* would in that case lie in segment 9 in *Drawida*. The seminal vesicles suspended from septa 10/11 and 11/12 in *Desmogaster* would be homologous with those suspended by septum 9/10, and those lying in somites 11 in *D. somavarpatana*, and so with respect to the ovaries. It is obvious that the holoandric sexual apparatus of *D. somavarpatana* brings the genus *Drawida* nearer to *Desmogaster*, besides pointing to a possible immediate descent.

Egg-sacs.—They are large, trilobed (being constricted more or less by septa), yellow structures lying on the œsophagus and gizzards, and are suspended from the posterior face of septum 10/11. They extend as far behind as segment 16. The ovaries are greatly lobulated organs occupying the anterior end of sacs, and I have been completely unable to discover the oviducts. In the fully mature forms, the ventral portion of the septal mesentery forming the anterior end of the egg-sac has mostly atrophied, permitting the escape of ripe ova into the cœlomic chamber 11. I cannot state with certainty how the eggs escape outside. Each sac is full of granular matter, which escapes from it on the rupture of the wall and comprises masses of yolk-spherules. Under the microscope numerous ova in all stages of maturity can be detected in the mass of spherules, which obviously are reserve food of the egg as well as the developing embryo. I have not obtained the cocoons of this species, which must have a quantity of this reserve-food laid up for it.

If an egg-sac, removed from a fresh specimen dissected out of water, is passed through alcohols for fixing, it is seen that the wall of the sac gradually becomes transparent and the volume of yolk-material really occupies about $\frac{2}{3}$ of the sac, and the rest of the space is filled by a kind of albuminous matter, which is soon dissolved. That it is an albumin can be readily ascertained by the simple salt-solution test, and this second class of proteinaceous substance does not belong to the globulin series. I have not proceeded further in the chemical analysis of the contents of the egg-sac of this species of earthworm,, and in microscopic structure (Pl. XVII. fig. 10) the wall of the vesicles comprises small glandular oval cells, which form the internal lining covered over by the septal mesentery. In the mass of the yolk-spherules is a rich network of blood-capillaries derived from the ventral and lateral longitudinal vessels. The albumin must be derived from the unicellular glands, which are modified cells of the cœlomic epithelium. It is an interesting fact in the physiology of the egg-sac that a part of it functions as vitellarium, and the female orifice must become considerably large for the extrusion of the eggs and the contents of the vesicles. The yolk is, however, the product of the vitellin or lecithin degeneration of the cytoplasm of the oogonia themselves. In the immature forms of this species the teased preparations of the egg sac show only ova as the principal contents of the vesicle, and the process of the formation of yolk in the sac can be followed in the slightly maturer worms. The nucleolus of some of the oocytes disappears in the nuclear sap, and perhaps escapes into the general mass of the cytoplasm, while that of others destined to become mature female cells remains unaffected. These modified cells increase in size, owing to a deposit of vitellin globules, and in the more advanced stages of degeneration the nucleus also is indistinguishable, and the modifying cytoplasm may be stained in certain areas of the cell-body, which represent yolk-nucleus. The cell-wall now degenerates also, and the mass of globules of yolk is held together only by an excessively thin pellicle, which breaks on the application of the slightest pressure.

The Nervous System.—Another feature of the anatomy of this species of earthworm that is really noteworthy is the extremely generalized structure of the nervous system (Pl. XVI. figs. 6, 6*a*). The nerve-cord is composed of two lateral bundles of fibres and cells, with clear fairly broad median hyaline space not occupied by any tissue elements. It is easily noticed by the naked eye that this median space is grey, and is thus distinguishable from the white bundles on either side. Among the fibres present in each division of the cord two kinds are distinguishable, viz., the axons of neurons and the giant fibres which are not traceable to any cells. The latter are laid in four bundles in the cord, two marginal and two internal sets. The internal bundles lie on both sides of the median dividing hyaline space. There are no ganglionic swellings in any part of the cord, which is of uniform thickness throughout. The nervous system of this species is almost ideally constructed for the study of the details of the structure of the cells and fibre-connections, and a slight teasing and suitable staining with methylin-blue will unravel the intricacies of the nerve-paths far too difficult to be made out by a similar process in the other species of earthworms. In paraffin sections the excessively thin cœlomic epithelium is found to form an investment of the dorsal half of the cord only, the histological elements are seen grouped on either side of the clear median space, and interstitial spaces are occupied by a granular substance. The granular mass must be in the nature of a matrix, which together with the giant fibres and the muscular fibres must help to bind the cells together. The hyaline membrane forms the outer layer which, in the processes of imbedding, usually breaks in all directions, appearing under magnification like a network of fibrils. In so far as the two lateral bundles remain apart the nerve-cord is a primitive structure, but as regards its cytological contents it does not appear to be so. Numerous kinds of cell-bodies are distinguished in the stained entire cord, and follow a strict law as regards their position throughout the cord and also in the œsophageal ganglia. Mention must be made of the strikingly large spherical cells which I term "Central Cells," apparently without any axons, which I have not succeeded in making out. There are four of them in each segmental division of the cord, two in front and two behind the nerves, and their position in the cord can be better understood by reference to the figure. They are regularly repeated throughout, and are situated on the central bundles of giant fibres on either side of the median clear space. In regard to the details of structure of these giant cells, I might mention that the large, centrally placed nucleus bears a deeply staining nucleolus. The nuclear membrane is thick and clearly defined, and the chromatin granules are strung out on the linin fibrils. The cytoplasm of these huge neurons is full of tigroid or Nissl bodies, comprising masses of neurochondrian granules in addition to less deeply-staining granules, mostly aggregated near the periphery of the cell. These latter, perhaps, represent the disintegrating particles of reserve food-material. The usual network of fibrils is also present, but apparently without any implantation cone or axons. In line with these larger cells are others which are indifferent in their structure and are fibrobalsts. They occur also in the marginal portions of the cord. The true neurons are of two kinds, those with one only and others with two nucleoli. They differ from the giant cells in the possession of nerve-fibres, which lead out from them. Each axon immediately after emergence divides into two parts, the neurite and the dendrite. Even without teasing the nerve, it is easy to discover that there are eight of these neurons in each side of the ganglia or the point from which nerves are given off, and I have not noticed any neurite or dendrite crossing over from one side to the other. This is, again, a primitive organisation, and shows that each half of the cord is composed of self-contained ganglionic nerve-units. In regard to the structure of the nucleus and the cytoplasm, these axon-bearing neurons and others which occur always in pairs resemble the giant cells. Though there is no experimental or direct structural evidence to prove that the two kinds of axon-bearing cells are physiologically different, it is at least certain that the cells with double nucleoli cannot be functionally identical with those with a single nucleolus. In the prostomium it is possible to trace the neurites, both perceptory and distributory ones, from their source or origin to their insertion or ending, with breaks in the interval where the stain is unable to pick them. The fibres arising from the cells with double nucleolus are with difficulty traceable to the epithelial or sensory cells and tactile organs, and obviously the fibres springing from the other kind of cells with a single nucleolus must be motor in function. The margins of the cord and ganglia are composed of small oval cells with no fibres. The nucleus of these cells is small and stains deeply.

In the œsophageal ganglia the giant cells form almost an outer layer of cortex, while the oval cells aggregate round the bases of the nerves. The neurons are more deeply situated, but always in groups of four and four. The paired cells are absent from the two ganglia, and perhaps have been modified into neuroglia tissue or, better, neuroglia cells. Each of the neuroglia cells found associated with the groups of sensory and motor neurons is conical in outline, with nervous fine fibrils spread out among the other cells which they bind. Their bi- and trinuclear condition shows the syncytial tendency of these paired cells.

The communicatory dendrites of the sensory and motor neurons form an intricate plexus round the giant cells, which, perhaps in addition to the trophic function, may act also as a centre of cognition, and, though the absence of any processes from these large cells is not in favour of this view, yet their serial repetition in the cord, their position, and relation with the neurons on the œsophageal ganglia strongly point to their cerebral function.

The tactile bodies are the sensory epidermal swellings round the setæ, which just project beyond the surface of these whitish cutaneous swellings (Pl. XVII. fig. 7). In sections of skin taken in this region the swellings are noticed to occupy the distal half of the setal follicle, and are composed of two kinds of sensory elements. Those which are more filiform are apparently associated with the perception of movements, and hence are not sensory in the true sense of the term. They are closely related with the muscle-fibres which move the setæ and have also nerve-endings. The other kind of cells with which the filiform variety enters into intimate relation are shorter, spindle-shaped, with a granular deeply staining cytoplasm and central nucleus and nucleolus. These cells, at whose proximal ends the sensory fibrils enter, are more or less enclosed in a connective tissue vesicle, and hence constitute a true tactile organ. Between these cells enclosed in the vesicle is a small quantity of granular matter, which perhaps represents coagulated mucus and cellular debris, to which the whitishness of the papillæ must be due. Finer perceptory hairy processes, which are without any cytoplasm, project outside, forming a short hairy microscopic collar round the seta.

On the prostomium are found numerous aggregations of filiform cells in a state of uniform distribution, while at the tip and the sides of the tip are found curious pyramidal cell-associations, usually three in number (Pl. XVII. fig. 8). Their structure is identical with that of the spindle-shaped cells. The apex of the pyramid points outward and the sensory nerve-fibres enter the broad base. There is not any vesicular investment for them, and therefore they must be in the nature of primitive sensory organs, undoubtedly tactile in function.

Locality. Somavarpatana, Coorg, 4000 ft.

Type in the British Museum. Syntypes in Hamburg Zoological Museum, in the Indian Museum, Calcutta, and in the Central College, Bangalore.

Drawida scandens, sp. n.

External Characters.—Length 30 mm. to 48 mm.; diameter at the thickest anterior part 2 mm. and at the narrowest posterior part 1·75 mm.; number of segments 115 to 145.. Prostomium prolobous.

The setæ are closely paired, none on first somite. $aa = bc$; $dd = \frac{1}{2}$ circumference of body. The setæ on the anterior fifty somites are $1\frac{1}{2}$ to $1\frac{3}{4}$ times bigger than those on the hinder segments and are obliquely set. The longest setæ are ·6 and ·07 mm. at the nodule, and those from the hinder parts of the body measure ·32 and ·04 mm. at nodule. The free ends of longer setæ are spatulate and those of the shorter set pointed, an adaptation obviously connected with the scansorial habits of the worm. The base of the longer seta-groups is surrounded by a circular or slightly oval, discoidal, cutaneous, slightly raised marking.

Dorsal pores are present, fairly large, commencing from somites 16 or 17. Nephridial apertures large on seta-line *d*. The clitellum is well-marked, somites 9, 10, 11, 12, and 13 being affected; frequently somite 14 is also involved.

The genital markings are not elaborate and consist of an elevated circular area around the male orifices. The two areas may become confluent, producing a raised transverse pad. Similar markings may be found around the female pores. All these areas are bisected by intersegmental grooves. Atrial papillæ occur, and frequently show through the first pair of male apertures.

Spermathecal pores are simple, large in the intersegmental furrow 7/8 on seta-line *a*.

Two pairs of male apertures on seta-line *ab* in 9/10 and 10/11. Each aperture is a large transverse slit with tumid lips.

The female pores in 11/12 internal to seta-line *a*, conspicuous only in a few forms.

Colour.—Live specimens are bright deep green or almost blue, the clitellum being distinguished by crimson-red. The ventral median line is grey, almost transparent, through which the nerve-cord is visible. The red of the clitellum fades in the preserving fluids, and the warm blue degenerates into a dull olive-green.

Internal Anatomy.—The skin of this species of *Drawida* is structurally more complex than that of any other worm with which I am acquainted. When a few drops of formalin were added to the water in which the worms were plunged, they became coated all along the dorsal line with a dense milk white secretion in large drops. Being somewhat viscous, it dissolves in water with difficulty and hot water coagulates it. Obviously it is rich in albuminous contents and has a slight alkaline reaction; when dried it forms minute cubic crystals. This phenomenon, not noticeable in any of the other species in my collection, led to a microscopic examination of the sections of skin (Pl. XVII. fig. 9). It comprises the usual layers of polyhedral epidermal cells; the chromatophores form a fairly thick layer below. I do not find any difference as regards the structure between the chromocytes bearing the green pigment on the body and those bearing the red on the clitellum. In addition to the ampulliform mucous cells situated between the polyhedral epidermal cells, there occurs another type of glands composed of syncytial aggregation of a large number of cells. There are a pair of such glands in each somite, placed at right angles to the axis of the body on the dorsal surface. The border of the gland is sinuous, indicating the incomplete fusion of the cells, whose boundaries are not, however, recognisable in the body of the structure. The spaces seen in the body of the gland constitute the duct, which is intracellular, and the external orifice is placed close to the dorsal pore on either side. Microscopically examined, the secretion shows the presence of cœlomic corpuscles, which must have been added to it outside the body. Many species of *Megascolex*, *Acanthodrilus*, and *Octochætes* are known to extrude quantities of cœlomic fluid under irritation besides the ordinary mucus, but a specific secretion of this nature is remarkable in a worm not distinguished much by size.

Muscular System.—Around the seta-follicles in the anterior somites the skin is disposed in discoidal form with a distinct annular rim. The disc is composed of circularly arranged muscle-fibres, while, at any rate, some of them belong to the transverse series, for a few of these sphincter-like fibres are continuous with the bundles composing the transverse bands on the genital somites. There can be little doubt that they must be associated with the habits of climbing vertical surfaces. The additional internal transverse bands of muscles in the genital somites are absent.

Septa 6/7, 8/9 are very thick, chiefly the last two; septum 9/10 only slightly so, while the succeeding ones are very tender. Septa 8/9 and 9/10 may be dislocated backward and forward respectively by a somite's length (Pl. XV. fig. 3 *b*).

Alimentary Canal.—Pharynx is large and muscular, occupying more than three segments, and the muscle-bands have the usual thickened appearance of septa. Œsophagus simple, slender, extending up to somite 10. Gizzards three, fairly large, occupying somites 10–16 or 11–16. No dorsal enteric appendages, or only a few are present. There is no typhlosole.

Circulatory System.—There are five hearts, the last being placed in segment 10. A lateral longitudinal vessel is present, extending up to somite 22, connected to the dorsal vessel by secondary commisures which are given off from the hearts near their point of origin. The vessels are mainly composed of connective tissue, the muscle-fibres being confined practically to the hearts.

Genital System.—The male organs comprise *two* pairs of testis-sacs, suspended by septum 9/10 on its anterior and posterior faces, those of one side right or left in a state of fusion. The septum 8/9 is usually very thick and generally, though not as a rule, dislocated backwards, and the seminal vesicle belonging to this septum leaves its place of origin and becomes attached to the anterior wall of septum 9/10. All the vesicles lie close together dorsally over the œsophagus, or may lie separated below this structure. The combined, yet distinctly bilobed, seminal vesicles are restricted to their own somites, if the septum 8/9 is not backwardly deflected; the testis-somites are nearly 1½ times larger than those in front or behind. In sectional preparations (Pl. XVIII. fig. 10 *c*) the spermatocytes are seen to occupy respectively the anterior inner border of their vesicles, the seminal funnel being in intimate contact with the testes. The other contents of the vesicles are sperms and trophocytes in various stages of development. The mesenterial wall forms a dense membrane, and is further supported by the presence of muscle-fibres, mostly irregularly disposed. The sperm-ducts are led off from the inner margins of the vesicles and are short, spirally coiled tubes, hidden by the lobate sacs themselves and the nephridia. Each duct enters the spermiducal gland near its anterior base. The prostate gland of each duct is long, whitish, soft in texture, pear-shaped or nearly cylindrical, readily comes to view on opening the worm, and is attached to the body-wall at the posterior face of septa 9/10 and 10/11. In microscopic preparations, the gland is seen to be composed of short club-shaped glands and circular muscle-fibres with the cubical epithelial lining. The atrial papillæ, developed more prominently in connection with the anterior male apertures, consist of an outer cuboid cell-layer and two sets of muscle-fibres derived from the body-wall. They are free from glandular bodies.

There can be little doubt that this species of *Drawida* is the most archaic of the known species, in possessing a more complete holoandric sexual apparatus than even *D. somavarpatana*, and indeed these two species render the generic character of the reproductive organ of the group, at least in one of their aspects, less universally applicable.

The ovaries are whitish-looking delicate bodies hanging from the anterior face of septum 10/11 without being contained in any specialized ovarian chamber. A greater part of the ovary lies in the sac, which is slender, constricted by septa 11/12 and 12/13, occupying nearly three somites, and lying over the first two gizzards. An entire sac examined under the low power of the microscope, even without much clearing, shows oocytes in different stages of maturation. I have not been able to make out an oviduct in any of the six examples investigated, and the chamber of somite 11 perhaps acts as a provisional chamber for the reception and extrusion of ova.

The spermathecal apparatus of this species approaches the condition met with in *Megascolex*. There is not any well-marked ampulla, possessing a structure comparable with that of the other species described in this paper. The duct has a slight dilatation which lies on the posterior face of septum 7/8 between the heart and the secondary vascular commissure, and is thus ventral in position to the dorsal vessel and the œsophagus. The duct is thin and spirally coiled; it penetrates septum 7/8 and enters the base of the atrial vesicle on its inner margin. The duct and its dilatation do not differ structurally, and hence an ampulla in the true sense of the term does not occur in this species, which, so far as I know, is the solitary example of the genus in this respect. The atrial or copulatory pouches are large, flattened antero-posteriorly, slightly bifid at the top. They occupy the greater portion of somite 7, in close relation with the lateral longitudinal vessel. The cavity of the pouch is narrow and irregular, and is lined by a columnar layer of glandular cells with large nuclei at the base. The cavity extends right up to the bifid ends of the pouch. The layer of circular muscles and the external layer of cells form a dense investment, which accounts for the compact texture of the organ. In sectional preparations the cavity was found full of granular material, some staining deeper than others, composing sperma and a mucous base.

Here is further evidence in support of my view that the atrial pouch, wherever one is present in *Drawida*, acts as a magazine of sperma, besides discharging a secondary secretory function.

The Nephridial System, which is meganephric, is not distinguished by any of the characters described in connection with *D. somavarpatana*.

The *Nervous System* and *Sensory Organs* do not call for any comments. The latter are filiform cells associated with the perception of movement, occurring largely on the prostomium and anterior somites.

Remarks.—I am unable to state precisely the nature of the function of the thick cutaneous humour, which is probably protective. At the time of collecting, which was after a slight drizzle in the morning, the worms were found either crawling about or climbing dense herbage, from which most of my specimens were taken.

Locality. Bhagamandala, 4000 ft., Coorg, S. India.

Type in the British Museum. Syntypes in the Indian Museum, Calcutta, and the Central College, Bangalore, and Hamburg Zoological Museum.

Drawida elegans, sp. n.

External Characters.—Length of preserved specimens 135 mm.; fully stretched live specimen 155 mm.; maximum diameter in the preclitellar region 7 mm. and behind 5 mm. Number of segments 200. The preclitellar somites, which are strongly telescoped, are three times as long as the postclitellar ones. All the segments bear annular ridges, on which the setæ are placed. These ridges are inconspicuous on the hinder somites, which become extremely short in front of anus.

Prostomium long and prolobous.

Setæ are small and closely paired in the anterior two-thirds of the body, while those behind are slightly larger occasionally. First somite free. $aa = bc$ or broader in the preclitellar region; in the postclitellar region $aa = 2/3\ bc$.

Dorsal pores present, commencing behind the clitellum.

Clitellum is definitely marked, extending over segments 10–13.

The genital markings are either completely absent or may comprise short segmental grooves and thickenings in front and behind the genital orifices, which may be connected by these grooves, as in some examples in the collection. In a few immature forms a faint dome-shaped swelling is present between and in front of the female apertures, which in some cases may be connected with the male pores by comparatively shallow grooves. Occasionally an oval thickening marked whitish surrounds the spermathecal opening. In some specimens which are fairly mature, there are slightly raised, thick, white patches on somites 5, 6, 7, 8, 9, and 10 without any genital significance, confined either to the ventral or dorsal surface of the body-wall; such white patches on the contiguous segments become confluent, and do not in any case occupy more than 1/3 of the body-diameter.

Spermathecal apertures in groove 7/8 in seta-line *cd*.

Male openings in intersegmental groove 7/8 are transverse slits, surrounded by two swollen lips and are halfway between *bc*. Atrial papillæ occasionally project through the apertures.

Female orifices inconspicuous in furrow 11/12 on seta-line *a*.

Nephridial openings large in seta-line *d*.

The colour of this species of earthworm is very widely variable. Most specimens in the living condition were bright pink with milk-white or olive-green on the posterior one-third of the body. Occasionally the pink was replaced by a pale violet or saffron-yellow with the same colour-markings as in the first case. In the preserved specimens the pink and white entirely fade, but traces of the other colours are retained.

Internal Anatomy.—In the larger worms the skin, specially in the preclitellar and hinder regions of the body, is very thick and is almost leathery, due to the development of the muscles and a peculiar form of connective-tissue fibres. In the macerated stained preparations of the skin, some of these fibres which lie above the circular muscles possess a beaded structure, showing their multicellular origin. Others are wavy and are disposed longitudinally—a fibre extending over more than two somites. The wavy fibres are not granular, while the cells included in the beaded variety, which is an incipient fibre, are deeply stained (hæmatoxylin). It is to these fibres that the toughness of the skin-texture and its considerable elasticity are due. In sections of the skin obtained from the posterior white portion, the occurrence of large cubical cells with considerably thick walls, either empty or full of a deeply staining mass, forms a conspicuous feature. The granular mass is the coagulated mucus whose presence accounts for the milk-whiteness of this region of the body. In the specimens in which the preserving fluids have thoroughly dissolved the lipochrome pigments and the mucus of the cells, the skin, chiefly in the anterior region, becomes transparent, through which the reproductive organs, the nerve-cord, and the subneural vessel can be seen. But the opacity of the skin in the posterior part is due to the inaccessibility of the mucous cells to the solvent action of spirit, for the superficial epidermal cells in this region form a fairly thick corium.

Septa 5/6–8/9 are very muscular, about three times as thick as the skin, are shifted backwards about the distance of three somites, and are telescoped into each other. In consequence of the backward deflection of septum 8/9 extending as far behind as somite 11, septa 9/10, 10/11 are absent or are only imperfectly developed. In the region of the gizzards, a fusion of septa 13/14 and 20/21 may take place in some mature forms, and only imperfectly so in others. The succeeding septa are tender up to somite 120, when they again become as thick as or thicker than the skin. Septa 11/12 and 12/13 form an imperfect ovarian chamber.

There are generally four, occasionally five, hard-walled yellow gizzards, occupying somites 13–21. Each gizzard is very large and muscular, taking up two segments, and the softer annuli between them are very greatly developed. These are followed by a series of 3 to 6 softer gizzards, smaller than the anterior ones, placed in segments 22 to 30; thus each of these secondary ones also taking up a segment. The alimentary canal is thin and is without a typhlosole, and behind segment 120 the intestine becomes conspicuously white and thick-walled. In transverse sections the lumen of the intestine appears as a narrow vertical slit, the walls touching one another. The intestinal wall in this region is composed of very greatly developed circular muscles, with radiating bundles of the same tissue, which in the intersegmental constrictions pass into the septa. Scattered throughout the wall are oval cells, which form a definite layer on the outer surface; each cell contains a deeply staining protoplasmic mass and a central nucleus. Such cells occur over the entire intestinal wall behind the gizzards. The cavity of the intestine is lined by a double layer of chloragogen and columnar cells. The latter are irregular in outline, producing a jagged appearance on the inner surface. Judged from the nature of the occurrence and distribution of the oval cells, a great many of them are found in the muscles of the body-wall, it is possible to infer that they are associated with the absorption and transmission of food.

Alimentary appendages are present; those on the softer gizzards are extremely vascular. The vessels of these appendages are derived either from the dorsal vessel or from the supraintestinal trunk.

The last heart is in somite 10. The dorsal vessel over the gizzards and anteriorly is considerably stout, and follows a more or less zigzag course. The most anterior heart is in segment 6. In the majority of forms in my collection there is a supra-intestinal vessel. The phenomenon of opacity is common to the dorsal vessel and the last hearts. Secondary commissures are only rarely present, as the occurrence of the lateral longitudinal vessels is arbitrary. A supra- and an infraneural vessel is present, the latter together with the nerve-cord is visible through the transparent skin. The distribution of the vessels is similar to the plan described in *D. somavarpatana*.

The testis-sacs depend from the remains of septum 9/10, and occupy segments 10 and 11. Each sac is an irregular oval body, more or less attached to the dorsal vessel and the hearts by the mesenterial wall. Its histological structure and arrangement of testis-cells and funnel are identical with those of the anterior pair of vesicles described in *D. somavarpatana*. In the testis-sac the position of the funnel is easily made out from the area of iridescent shimmer on its wall.

The sperm-duct leads off from the posterior ventral margin of the sac, and forms a dense matted structure adhering to the wall of the vesicle, which it partly covers. The duct, which when in the matted condition occupies nearly three somites, is fairly thick, due to the large development of the circular muscles around the internal ciliated epithelium, and when uncoiled is over 65 to 70 mm. long. The duct enters the prostate at its apex, which is slightly indented.

The spermiducal gland, or the prostate, is a large pyriform organ sessile on the body-wall, its vertical axis being twice or slightly more than twice its antero-posterior diameter. In some specimens the glandular part with its club-shaped cells is really confined to the ental and ectal divisions, while the rest of the wall is composed of a few muscle-fibres and cubical epithelial cells, thus converting the glandular structure into a vesicle in which the sperm-duct lies in several coils. The atrial papillæ are comparatively small.

There is an ovarian chamber, *i. e.* segment 11 remains closed on opening the worm, though sometimes the sides may rupture on stretching the animal. The ovisac, which looks rather like the pistil of the pea, protudes from this chamber into segments 12 to 14. The ovary is enclosed in the sacs, which lie over or on the sides of the first two gizzards. There is no oviduct, but the side-walls of the ovarian chamber approximate so as to form separate ovarian conduits. The female aperture is small in all the forms investigated.

The spermathecal ampullæ (Pl. XV. fig. 3 *c*) are lodged in depressions on the posterior face of the fat septum 7/8, and are completely hidden by the equally thickened posterior septum. Sometimes the depressions for the lodgement are absent. The two ampullæ are close together, being separated only by the dorsal vessel. In shape they are subspherical and are whitish-looking. In the teased preparations the contents were only a coagulated albuminous mass easily dissolved by alcohol and acetic acid. The microscopic structure of the ampulla is identical with that of the similar structure of *D. somavarpatna*. The spermathecal duct is fairly thick and lies in a few coils in the large cavity of somite 8, and penetrates the septum 7/8 at the base, and follows the somewhat tortuous course in the hinder part of somite 7. It enters the atrial pouch at its apex, which it fairly deeply pitted. The vesicle is a large, strongly muscular, pear-shaped gland fixed to the body-wall by the narrow end. It lies fore and aft to the long axis of the body. The sides of septum 6/7 are greatly hollowed out for the reception of these glands, in which the duct opens out into a large sac. In the fully mature forms the atrial pouch looks like a barrel with spiral hoops of muscle-bands, which form a conspicuous external feature. The glandular portion in such a case is confined to the two ends of the organ. The cavity of the vesicle is composed of a lining membrane (Pl. XVIII. fig. 10 *d*), whose cells are much larger than those of the duct, and by their greatly irregular arrangement give rise to recesses in the chamber. Surrounding this internal membrane is a mass of subspherical cells, which on account of mutal pressure may assume an oval shape. These and the lining cells stain deeply, and the nucleus in them is large and centrally placed. A few of these surrounding spherical cells look empty in sections, having previously discharged their contents into the vesicular chamber. None of these glandular cells possess any ductules. In the more mature forms, in which the muscles of the pouch are gathered into spiral hoops, the internal cavity is disposed into a slight spiral form, and in those forms in which the muscles are not so aggregated they form a close and continuous investment, which accounts for the very tough character of the whole organ. The outer membrane of the pouch is composed of numerous layers of cubical cells, those at the surface being almost flat. The protoplasm of these cells is granular, and the nucleus stains deeply. The blood-vessels run in all directions in the substance of the gland, and in the transverse section they appear cut across and also lengthwise. The whole wall is further impregnated by a mass of white granular substance of an albuminous nature, staining with hæmatoxylin and derived from the glandular cells. It is the presence of these bodies which gives a milky-white shimmer and opacity to these organs, which become almost transparent on dissolving them.

The nephridial system of this species of *Drawida* is remarkable. The nephridia in the hinder region of the body, where the alimentary canal becomes thicker, give off a duct from the third lobe, which opens into the intestine. The tubules from the two nephridia in any segment in this region have a separate opening. Thus each nephridium opens outside on the seta-line *cd*, as well as into the intestine. More anteriorly, the nephridia seem to have a similar secondary opening into the intestine, at least into the gizzards, but I have not succeeded in finding out if all the nephridia have an intestinal opening. Depending from the third lobe, close to the point where a vascular twig from the subintestinal vessel enters it, is an accessory lobe, more or less sacculated, containing minute bluish spherical bodies, which lie on either side of the non-ciliated wide duct. Possibly these bodies are concretions of waste matter. These accessory lobes are absent from the more anteriorly placed nephridia. In addition to the meganephridia, each somite contains a pair of integumentary nephridia also. These are composed of a much convoluted glandular tubule attached to the peritoneal wall, being separated from its fellow on the opposite side by the dorsal and ventral mesenteries. They occur throughout in all somites, except the first three anterior ones. The lobes of the integumentary nephridia are whitish-looking mushroom-like structures composed of twisted tubules, and are placed on the seta-line *cd*, where they open along with the meganephridia. The lobes of the integumentary nephridia are a characteristic feature of the internal surface of the body-wall in the opened specimens. I am not quite sure whether there are two independent nephridiopores, and I have not succeeded in making out how the integumentary tubule opens outside. The integumentary nephridium has not a funnel-like nephrostone, which, however, is represented by a simple dilatation of the inferior limb in the mid-ventral line. The ductules of the integumentary nephridia are absolutely narrower than those of the meganephridia.

The nervous system and sensory organs do not call for any further remark than that the latter are in every respect like those of *D. somavarpatana*. The nervous system is more highly organised than in the case of the two foregoing species described here.

Locality. Bhagamandala, 4000 ft., Coorg, S. India. The type is in the British Museum; syntypes with Prof. Dr. W. M. Michaelsen, in the Indian Museum, Calcutta, and in the Central College, Bangalore.

Drawida modesta, sp. n.

External Characters.—Length 72 mm., diameter in the preclitellar region 6 mm. and in the postclitellar part 4½ mm.; number of segments 221, those of the middle and the hinder part of the body are very short.

The setæ are moderately large, closely paired, *aa*=*bc*. The first somite is free from setæ. *dd* is less than half the circumference.

Prostomium very small and prolobous.

No dorsal pores.

Clitellum well-marked over segments 10–13. The genital markings are simple. The ventral part of somite 7, between the spermathecal openings, is hollow, terminating on either side anteriorly in a conspicuous oval grey glandular lobe of skin, a feature which I have not noticed in any other species of *Drawida* with which I am acquainted. Around and between the male orifices is a fairly deep oval groove. A similar marking of grooves is present around the female pores also. On somites 9 and 8 there are faint circular markings in the line of genital pores. The male apertures with thick lips are large transverse slits in the furrow 10/11, extending nearly over half *aa* and outwardly nearly over half *bc*. The slit is straight, and the depression surrounding it is confined to the posterior half of somite 10. The female orifice is as large as the male opening, situated externally to seta-line *b*.

Each of the female pores extends inwards as far towards the median line as the male orifices do. The lips are swollen. The body-wall in the mid-ventral line between the depressions surrounding the genital pores is raised in the form of a ridge. The spermathecal pores are large, slit-like, curved openings in line with the male pores, the chief convexity being directed posteriorly. In front of each slit is the already noticed glandular oval thickenings of the skin. The nephridial pores are placed on seta-line *cd*.

The colour of live specimens was distinguished by a grey clitellum, the preclitellar portion was a mixture of yellow and brown. The rest of the body was deep yellow with blotches of brown. In the preserved specimen the yellow is present only poorly.

Internal Anatomy.—The skin is very tough and leathery, and in point of histological structure is like the skin of the foregoing species, *D. elegans*.

Additional internal circular muscles in the genital somites are present.

Septa 5/6–8/9 are very thick; the posterior face of septa 7/8 and 8/9 bear deep annular grooves with corresponding ridges on the opposite surface. Septa 9/10 and 10/11 are extremely tender or have atrophied. Subsequent ones are excessively thin.

There are two gizzards occupying somites 10–14. The anterior is soft-walled, occupies 1½ segments, and the posterior is large, thick-walled, taking up 3½ segments. The alimentary appendages are few and fairly large.

In regard to structure and disposition of vessels, the circulatory system of this species is similar to those of *D. somavarpatana*.

The testicular sacs are very large, and, instead of depending from the posterior face of septum 9/10, are attached to the body-wall. This is the first example of *Drawida* in which a sessile seminal vesicle is reported. Each vesicle has convex outer surface, the anterior and posterior faces are either bevelled or are hollow, and the inner margin, which is a narrow ridge, is transversely ribbed. In cross-section it is like the sector of a circle with the radii bent in. The length of vesicles is greater than their breadth by about a fourth, and they occupy more than 2½ segments (9, 10) and nearly the whole of 11. The sacs, which are visible through the translucent skin, are attached to the body-wall on the ventro-lateral line, external to the prostates, and round the base of attachment there is a furred white membrane which represents the remnants of septum 9/10. Septum 8/9 is also deflected backwards over the testicular vesicles, forming an additional external investment. The testis is a large mushroom-like organ placed about the middle of the vesicle. The funnel is closely attached to it, and the position of the former is externally marked on the inner ridged portion of the vesicle by a rectangular iridescent area, from which the sperm-duct leads off. In the first part of its course the duct is spirally twisted, and runs inwards. It doubles backwards, and is entangled in the mass of tubules belonging to the nephridial lobes, blood-vessels, and muscle-fibres. The duct enters the prostate on its posterior face. The spermiducal gland is a white, cushion-like, spherical body, sessile on the body-wall in segment 10 close to the base of septum 10/11. In point of microscopic structure, the gland is in every detail like that of *D. somavarpatana*. The atrium is without a papilla.

The ovisacs are of considerable size, extending backwards up to somite 14 and overlapping the gizzards in the mid-dorsal line. On opening the worm, the contents, a mass of yellow yolk, tumbled out; the wall of the sac, being excessively thin, ruptures on the addition of the slightest pressure. When examined microspically the yellow spherules were found to form a dense covering for the very large ovum. I have not been able to make out what the ovary is like. The oviduct is large and convoluted, and its mouth commences at the point of the non-fusion of septa 10/11 and 11/12, which, however, adhere everywhere, forming a kind of spacious chamber. The stem and the greater part of the sac, together with the oviduct, are included in this chamber. The duct opens at the base of the posterior face of septum 11/12.

The ampulla of the spermathecal apparatus is situated over the nephridial arch on the posterior face of septum 7/8, to which, however, it is not attached. It is subtriangular in shape, the apex being directed inwards, the anterior and posterior faces converging towards the ventral ridge. Thus in vertical section also the ampullæ are triangular. They are conspicuously white and nestle in the septal grooves, and overlap the hearts and the dorsal vessel. From the middle of the ventral ridge is given off the large duct, whose coils are hidden by the ampullæ, the nephridia, and the hearts, which are exceedingly thick-walled and large. The duct enters the atrial pouch at its summit; the pouch itself is imbedded in the septal wall 7/8 (Pl. XV. fig. 2 D). Consequently the duct does not penetrate it. The pouch is cylindrical and thin-walled, into which the duct opens out into a large chamber. The microscopic structure of the pouch is in every detail like that which is met with in the ectal end of the atrial pouch of *D. somavarpatana* already described. In the preparations of the pouch and the ampulla I did not find any sperma.

Nephridial System meganephric. The nephrostome has a secondary funnel. None open into the intestine, except the anterior ones in the pharyngeal region.

The nervous system is highly organized, like that of *D. elegans*.

Locality. Moornad (Hill valleys, 3500 ft.), Coorg, S. India.

The type is in the British Museum; syntype in the Central College, Bangalore. Only two specimens are included in the Collection.

Drawida paradoxa, sp. n.

External Characters.—Length 90 mm.; preclitellar diameter 5 mm.; postclitellar diameter 4 mm.; number of segments, 152. Preclitellar somites telescoped and twice as large as the postclitellar ones. No secondary annulations.

Prostomium very large and prolobous.

Setæ are small, closely paired; *aa*=*bc* generally throughout, though in some specimens *aa* is less than *bc* in the anterior somites; *dd*=½ circumference of body. The seta-lines are distinctly marked by broad longitudinal grooves, produced apparently by the muscle-bundles slightly diverging from one another. The setal bases are surrounded by conspicuous, white, papilla-like elevations, having the same microscopic structure as those described under *D. somavarpatana*.

The limits of the clitellum are indefinite, but yet can be marked by the slight thickening of the body-wall of somites 10–13.

Dorsal pores are present, and commence from behind the clitellum from somite 14 or possibly 15.

No genital markings.

Spermathecal and female apertures not visible. The male orifice is equally indistinct in the majority of forms examined, and only in a few appear as curved slits in the furrow 10/11 external to seta-line *b*.

Nephridial pores on seta-line *d*.

The colour of these forms at the time of capture was a deep chocolate anteriorly and greenish brown over the posterior half of the body. In the spirit-specimens the chocolate is rendered into a pale violet or mauve, and the rest of the body is pale brownish.

Internal Anatomy.—The first recognisable septum is 2/3, and is broken up laterally. Septa 3/4 and 4/5 have the same ill-defined lateral walls, their place being taken by powerful muscles, which form part of the pharyngeal muscular system. Septa 5/6–8/9 are thick. The succeeding ones are tender.

The pharynx is muscular and occupies four somites (2–5). The retractor muscles, which connect the pharynx to the parietes, bear masses of glandular cells in somites 3–5 nearer to their pharyngeal ends. In the species of *Drawida* described and others to which reference is made in this paper as having been subjected to investigation, I have noticed the presence of white glandular masses of cells on the posterior face of septa 2/3–4/5. Examined microscopically, the masses are seen to be composed of spherical cells mainly aggregated round the septal vessels, and may be therefore looked upon in the nature of blood-glands, though in a very incipient condition of development. I have not been able to detect any ductule issuing from these septal blood-glands, nor from the gland-masses aggregated on the muscle-bands of this species. In segment 5, however, of *D. paradoxa* are found masses of distinct glandular lobes, white, more or less flattened, and closely applied to the dorsal and lateral pharyngeal wall, completely hidden by the forward deflection of the septum 5/6. When an entire gland is removed with its connections, cleared, and examined, a ramifying system of canalicules, which obviously drain the cellular secretion, may be detected. The cells themselves are large spherical bodies full of granular cytoplasm, with a distinct, centrally situated, large, rounded nucleus. A few muscle-fibres constitute the matrix of these glands, which have no relation with the septum. In the sectional preparations the discrete openings of these glands into the pharynx and a glandular pharyngeal epithelium, having essentially a cytological structure similar to the glands, are detectable. There can be little doubt as regards the glandular pharyngeal epithelium discharging a digestive function, and in that case the glands in somites 5 and those on the pharyngeal muscle-band may be simply water-conserving organs. Unfortunately, there was not an opportunity to do any experimental work on the physiology of these organs.

There are three bigger gizzards occupying somites 12–14, the first one softer and more conically built, and the hinder two firm and spherical. The fourth gizzard in somite 15 is just half the size of the spherical one in front, and is hidden from view. The wall of the intestine in somites 16–17 is very muscular, and simulates the appearance of gizzards. Enteric appendages are conspicuously developed, as in *D. somavarpatana* and *D. elegans*, and the number of digitate lobes present in any appendage may reach about 20, some of which at any rate are in an incipient stage of development. The one feature about these appendages which requires mention is the fact that these lobes become in some forms enveloped in a distinct peritoneal membrane, which passes over the dorsal vessel, thus becoming organised into a lobate gland.

The dorsal vessel in somites 5–17 is greatly thickened, and follows a greatly tortuous course in somites 12–17. The last heart is in segment 9; occasionally an additional one in segment 10. There is a subneural vessel.

The testicular sacs lying in segments 9–10 are large, spherical, opaque bodies, rather greyish, covered over dorsally by the backward deflection of septum 9/10 (Pl. XV. fig. 3 *c*). They meet over the dorsal vessel in the median line. From the inner lower border of each vesicle is given off the spermiduct, which is large, lying in two most intricately coiled masses, each nearly as large as the testicular sac itself. These spermiducal masses lie on the sides of, in close contact with, the sacs and below the œsophagus. From the subœsophageal mass the coiled vas deferens issues to meet the prostate, which is engrafted on a second testicular sac. The testis of the spherical vessels is attached to their lower inner border, closely adherent to the funnel, whose position is easily detected by the iridescent or golden-yellow area from which the muscles of the sacs radiate. The engrafted prostate surrounds the second tubular vesicles on the top and the anterior and posterior margins, the sides being free, and extending ventrally only up to the point where the thicker second vas deferens commences. The spermiduct belonging to the spherical vesicle enters the engrafted prostate at about half its height anteriorly. The cylindrical vesicle pushes backward the septum 10/11 by about the length of nearly two somites, and is encapsuled by it and two other posterior septa. Owing to the prostates the entire structure is flat. From below, a stout bent tube, the second vas deferens, is given off and is inserted into the upper end of the posterior division of the sessile prostates. In the sectional preparations the histological elements composing the sessile prostates are also met with in those of the spermiducal gland surrounding the tubular vesicle, in which the arrangement of the second testis is same as what has been described in the similar organs of *D. somavarpatana.* The coiled vas deferens of the spherical vesicles enters the tubular vesicle, and below this point the cells of the lining membrane of the latter lose all the character of spermatocytes and rather resemble those of spermiduct itself. Near the ental end of the second tubular sacs the sperm parent-cells are found in various stages of division.

The arrangement of the male reproductive apparatus of this species is very like that of *D. somavarpatana*, but only with such differences as have been indicated above. Strong broad bands of muscles connect the second pair of vesicles to the body-wall on both sides, such as have not been observed in any other species. This mode of attaching accounts for the difficulty of erecting the sacs for the purpose of examination.

The egg-sacs, which lie over the first gizzard, are shifted backwards by the length of two somites. They are slender tubular structures, mainly composed of yolk-platelets ; the ovaries, which are tufted organs, are attached to the stem of the sacs. Septa 10/11 and 11/12 are juxtaposed, but do not fuse, and the cœlomic chamber of segment 11 is nearly a shut cavity in which a coiled glandular oviduct lies, whose funnel is indistinguishably situated in the ovarian mass.

The ampulla of the spermathecal apparatus is small, oval, being situated on either side of the dorsal vessel in somite 8, only loosely attached to the posterior face of septum 7/8. The duct is thin and is only moderately coiled. It runs outwards, penetrates the septum 7/8 considerably over the ventral body-wall; the greater part of its further course lies in the thickness of this septum, which it leaves at the base for insertion dorsally into the anterior lobe of the copulatory pouch. The pouch is double-lobed, with a median constriction dividing the organ into unequal anterior and posterior parts (Pl. XV. fig. 2 E). The whole pouch lies in segment 7, and pushes backwards considerably over half a somite the septum 7/8. The cavity of the pouches is divided into a number of incomplete horizontal compartments with ridges, which, though running round the inner wall of the lobes, are discontinuous. In sectional preparations the ridges appear to be composed of a cord of small spherical cells with longitudinally disposed muscle-fibres, the whole of the ridge being compactly held by a thin cuticular pellicle. The entire pouch perhaps represents the greatly modified atrial tubules of *Moniligaster perrieri*—a view which in some measure receives support from the fact that these ridges are canalised in the case of forms which are just developing the spermathecal apparatus, and the peritoneal wall encapsuling them is still thin and devoid of muscle-fibres (Pl. XVIII. figs. 10 *h* & 10 *i*). The more complete organisation of the peritoneal investment into the atrial pouch must synchronise with the degeneration of the tubes into incomplete ridges.

The Nephridial System.—The vesicle in this species is non-glandular, unlike the other examples described in this paper, and hence has the same structure as that described in *D. grandis* (Pl. XVI. fig. 5). It is quite transparent, being composed of a few circularly disposed muscle-fibres, and, in the case of anterior somites in the front of the clitellum and even in some examples behind it, the vesicle opens by a broad circular aperture into the respective cœlomic chamber. A glandular vesicle is not, however, uncommon even in this species and then they are white and perfectly opaque. The nephridial lobes and their relation to the other structures are so different in this and the other species described in this paper from the figure of *D. grandis* given by Bourne (pl. xxvii. fig. 42, Q. J. M. Sci. vol. xxxvi.), that a few words respecting the renal organs will not be inappropriate here. The two vesicles form nearly a complete ring round the alimentary canal, almost meeting dorsally, but extending only halfway ventrally below the intestine. From the lower half of its stem is given off the slightly coiled muscular duct, which runs outwards to open on the seta-line *cd*. Among the glandular lobes we recognize the twisted and the looped ones. There are two of the former kind, one being longer than the other, both ventral to the alimentary canal, and the longer twisted lobes on each side are only separated by the nerve-cord. There are three looped lobes: two of them are in close relation to the sides of the alimentary canal on the inner side of the vesicle, and the third more or less attached to the muscular tube, and hence on the outer side of the vesicle. The funnel-tube enters the main glandular mass at the point where the inner looped and the twisted lobes diverge, and the duct of the funnel-tube also divides, entering respectively the two main divisions of the nephridial structure. In regard to the histological structure of the different parts, excepting the nephrostome, which is same as in *D. somavarpatana*, the nephridia of this species do not differ, from those of *D. grandis*, of which we have a most elaborate account by Bourne.

The Nervous System.—Both the cord and the œsophageal nerve-mass show the same disposition of the histological elements discussed under *D. somavarpatana*, and perhaps the only feature which distinguishes *D. paradoxa* is the absence of the large spherical central cells occurring in the internodes of the nerve-cord and also in œsophageal nerve-mass. This primitive character of the nervous system, associated with the presence of two pairs of testicular vesicles in two species of *Drawida*, is a morphological fact worth calling attention to.

Locality. Madapur (Coorg, S. India), Hill forests, 3500 ft. Type in the British Museum, syntypes with Prof. Dr. Michaelsen, Hamburg, in the Indian Museum, Calcutta, and the Central College, Bangalore.

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EXPLANATION OF THE PLATES.

PLATE XV.

Fig. 1 A, B, C, D, and E represent the genital markings and orifices of *D. somavarpatana*, *D. scandens*, *D. elegans*, *D. modesta*, and *D. paradoxa*, respectively.

Fig. 2 A, B, C, D, and E are the spermathecal apparatus of the species in the same order as in fig. 1. The atrial pouch in fig. D is contained in the septal wall 7/8. The pouches are cleared in acetic acid, so as to show the nature of the internal cavity.

Fig. 3 *a*, *b*, *c* represent the dissections of *D. somavarpatana*, *D. scandens*, and *D. paradoxa*. The septal deflections in the genital somites are a marked feature.

PLATE XVI.

Fig. 4. The left half of two somites' length of alimentary canal of young *D. paradoxa*. The anterior division shows the development of an enteric appendage and the second half contains a fully-developed appendage. A few of the multiplying cells have migrated to the tips of the muscle-fibres. The reflected membrane on the base of the appendage in the second half of the figure is the outer connective-tissue wall of the dorsal vessel.

Fig. 5. An entire nephridium of *D. paradoxa*: at points *a*, *b*, and *c* the structure of the vesicle and the different lobes is indicated in optical section.

Fig. 5 *a*. An entire nephrostome of *D. somavarpatana*, examined in glycerine. The secondary funnel is provided with stiff cilia.

Fig. 6. Transverse section of the nerve-cord of *D. somavarpatana*.

Fig. 6 *a*. A length of one-half of the nerve-cord of the same species, washed in silver nitrate and stained in methylin-blue, illustrating the mode of dendritic connections. Each nerve is composed of 8 to 10 fibres, of which only two are shown in the figure. The relative positions of the different nerve-cells and their dendritic connections have been drawn through Spencer Lens camera lucida. × 75.

PLATE XVII.

Fig. 7. Vertical section of skin of *D. somavarpatana* through the seta-follicle, showing the group of tall sensory cells which form the white papillæ round the seta (*ab*).

Fig. 8. Vertical section through prostomium of *D. somavarpatana*, showing groups of two kinds of sensory cells. The nerve-fibres in both preparations have been picked up by methylin-blue.

Fig. 9. Vertical section of skin of *D. scandens*.

Fig. 10. Transverse section of the egg-sac of *D. somavarpatana*.

Fig. 10 *a*. A teased preparation of the spherical testicular vesicle of *D. somavarpatana*.

Fig. 10 *b*. Transverse section of the tubular testicular sac of *D. somavarpatana*.

PLATE XVIII.

Fig. 10 *c*. Vertical section of the double testicular sac of *D. scandens*, showing their attachment to the septum 9/10.

Fig. 10 *d*. A sectional preparation of the ampulla of *D. elegans*.

Fig. 10 *e*. An entire ampulla of *D. scandens*, cleared and stained (hæmatoxylin).

Fig. 10 *f*. Transverse (a portion) section of the ectal end of the atrial pouch of *D. somavarpatana*.

Fig. 10 *g*. Section across the ental end of the same.

Figs. 10 *h*, 10 *i*. Section (a portion) across the atrial pouches of an adult and a young *D. paradoxa*; in the latter the ridge appears as a tube, the canal of which is obliterated in the former.

Fig. 10 *j*. A portion of the transverse section of the prostate of *D. somavarpatana* at the ectal end.

Lettering

amp., ampulla; *amp.c.*, ampulliform mucous cells; *a.s.*, albumin space; *at.*, arterial twig; *b.t.*, basement-tissue; *b.v.*, blood-vessel; *c.c.*, cœlomo- and hæmocytes; *c.c.'*, central cell; *c.ep.* and *c.nes.*, cœlomic epithelium; *c.g.*, cutaneous gland; *c.m.*, circular muscle-fibres; *c.m'.*, membranous capsule; *c.p.* and *cut.*, cuticular layer; *ch.ov.*, ovarian chamber; *ch.*, chitinous layer; *ch.'*, chromation fibres; *cop.p*, copulatory pouch; *cor.*, cortical layer; *d.*, dendrites; *d.p.*, dorsal pore; *d.v.*, dorsal vessel; *e.s.*, egg-sac; *em.*, epithelial membrane; *en.a.*, enteric appendage; *ep.c.*, epithelial cells; *f.*, funnel; *f.'*, fibrillæ; *f.c*, filiform cells (associated with the sense of movement); *f.o.*, female opening; *f.t.*, funnel-tube; *g.mus.*, genital muscle; *giz.*, gizzard; *g.f.*, giant fibres; *gl.c.*, club-shaped cells; *gl.ep.*, glandular epithelium; *gr.* and *gr.m.*, granules and granular matrix; *i.c.*, undifferentiated cells; *in.*, intestinal wall; *in.l.*, inner looped lobe; *h.s.*, hayaline space; *l.m.*, lining membrane of seta-follicle; *l.t.l.*, longer twisted lobe; *m.* and *m.f.*, muscles; *m.c.*, marginal cell; *mg.f.*, marginal nerve-fibres; *m.i.*, muscles of the intestine; *ml.*, layer of megacytes (trophocytes); *m.m.*, metamorphosing muscles arranged like the ribs of a fan; *m.o.*, male opening; *m.t.*, muscular tube; *mt.c.*, motor cells; *m.w.*, mesenterial wall; *n.*, nuclei of syncytial cells; *n.c.*, nucleolus; *n.p.*, nucleoplasm; *ol.*, incipient trophocytes; *op.c.g.*, opening of cutaneous gland; *otl.*, outer looped lobe; *ov.*, ova and ovary; *ovd.*, oviduct; *out.ep.*, outer epithelial cells; *p.*, perceptory processes; *p.c.*, sensory processes of tactile cells; *p.c.'*, proliferating peritoneal cells; *p.c.''*, paired cells; *per.*, peritoneum; *pyr.c.*, pyramidal cells; *s.c.*, sensory cells; *s.d.g.*, spermiducal gland (prostate); *sep.*, septum 7/8; *sept.* and *sept.m.*, septal membrane; *s.f.*, secondary funnel; *s.f.'*, seta-follicle; *sh.*, connective-tissue sheath round the dorsal vessel; *s.o.*, spermathecal opening; *sp.b.*, sperm-blasts; *sp.c.*, spherical cells; *sp.d.*, spermiduct; *sp.m.*, sperm-morula; *sp.s.*, sperm-sac; *st.l.*, shorter twisted lobe; *t.b.*, tigroid bodies; *tc.*, testis-cells; *v.*, vesicle; *y.c.*, yolk-cells; *y.sp.*, yolk-platelets.

LI.—*Notes on the Species of* Notomys, *the Australian Jerboa-rats.* By OLDFIELD THOMAS.

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THE interesting jerboa-rats forming the genus *Notomys* have long been in a state of considerable confusion as regards the species that exist, or, rather, have existed; for it is to be feared that few of them still survive, except in the centre and north of the continent.

When Central Australia was being explored under the direction of Prof. Baldwin Spencer, a certain number of specimens were obtained, and Mr. Waite published some valuable notes on these[*]. He formed on them the groups *Podanomalus* and *Thylacomys* (which he afterwards renamed *Ascopharynx*); but, as I have elsewhere[†] shown, these names should be merged in the earlier *Notomys* of Lesson.

The throat-pouch described by Mr. Waite appears to be present in most if not all of the species, and would seem to be a skin-gland, such as many rodents, bats, and marsupials possess in a similar situation. Its use is probably of a sexually attractive nature, and I cannot at all accept the suggestion of Mr. Waite that the pouch might be of use for storing food, as is the case with the American Geomyidæ and the European Hamsters. Its structure and general appearance seem to me to preclude any such possibility.

The two main causes of the confusion that exists as to the species are, firstly, the publication by Gray of several names without descriptions, and, secondly, the fact that Gould, who had an excellent hunter's knowledge of the forms dealt with, knew nothing and gave no descriptions of the skulls, by which alone the species can be satisfactorily determined.

The following notes are based on a study of the series in the British Museum, which contains specimens obtained by

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[*] P. Roy. Soc. Victoria, (2) x. pt. ii. p. 117 (1898).

[†] Ann. & Mag. Nat. Hist. (7) xvii. p. 83 (1906).

Sturt, Mitchell, and the earlier explorers, but, sad to say, comparatively few recent examples, as these interesting animals seem to have become very rare, if not altogether extinct, in the more inhabited parts of Australia. The types of all the species, except *mitchelli* and, if a *Notomys*, *conditor*, are in the Museum collection.

1. *Notomys longicaudatus*, Gould.

Hapalotis longicaudata, Gould, P. Z. S. 1844, p. 104; id. Mamm. Austr. iii. pl. viii. (1845).

Largest of genus; hind foot about 45 mm.; skull about 39 mm.

The usual dull brown above and greyish below. Tail very long, well tufted. Skull large, heavy, with large well-open palatal foramina and large bullæ. Upper molar series 6·5 mm.

Hab. Western Australia. Typical specimens from Moore's River, collected by Gilbert for the Gould Collection. A third specimen received in the Tomes Collection.

Type (lectotype). Female. B.M. no. 44. 7. 9. 15.

2. *Notomys sturti*, sp. n.

A long-tailed species, rather smaller than *N. longicaudatus*.

Proportions about as in *longicaudatus*, though the feet are relatively larger. Colour apparently about as in that species, but the only specimen has had the distal part of the fur singed off, so that the exact shade cannot be described. Feet very slender.

Skull apparently similar to that of *N. longicaudatus*, but smaller in all dimensions. There is, however, no evidence as to the size of the bullæ.

Dimensions of the type (measured on skin):—

Head and body 132 mm.; tail 200; hind foot 45.

Skull: back of frontals to tip of nasals 25·6 (in *N. longicaudatus* 28·5); nasals 13·8; interorbital breadth 6·5; palatilar length 16·3; palatal foramina 8 × 2·3; upper molar series 5·8.

Hab. Interior of New South Wales in the Lower Darling region. Type "captured in the Coonbaralba Range about 85 miles from Laidley's Ponds." This would appear to be in what is now Farnell Country.

Type. Adult female. B.M. no. 46. 5. 14. 43. Collected July 1845, and presented by Capt. Charles Sturt, in whose honour I have thought it might suitably be named.

This interesting specimen is one of the remains of Capt. Sturt's famous expedition of 1844–45 into Central Australia. Rats of this genus are frequently mentioned in the course of his 'Narrative,' and were said to be then excessively common. But I have not been able to find any reference which can be certainly assigned to this particular animal.

The species is readily recognizable by its long tail and other resemblances to *N. longicaudatus*, combined with its markedly smaller size.

"A rat like a diminutive kangaroo, called Tālămbā by the natives."—*C. Sturt.*

3. *Notomys gouldi*, Gould.

The synonymy of this species almost defies elucidation, owing to Gould's misdeterminations, to Gray's publication of names without descriptions, and to the belated publication of the plates of the 'Erebus' and 'Terror' in 1875, though they were quoted by other authors far earlier. The following appears to be an approximation to the truth:—

Hapalotis gouldi, Gray, Grey's Journ. ii., Appendix, p. 404 (1841) (nomen nudum).
  Id. List Mamm. B.M. p. 116 (1843) (nom. nud.).
Hapalotis mitchelli, Gould, Mamm. Austr. iii. pl ix (1845) W. Australia; nec *Dipus mitchelli*, Og. Specimen B.M. no. 7. 1. 1. 135 received with the Tomes Collection.
Hapalotis gouldi, Gould, P. Z. S. 1851, p. 127 (nom nud.).
  Id. Mamm Austr. iii., Introduction, p. xxxv (1863). "*H. gouldi* of Gray will be the correct designation of the animal I have called *H. mitchelli*."
Hapalotis richardsoni, Gray, Voy. 'Erebus' and 'Terror,' Mammals, p. 12 *d*, pl. xxviii. fig. 2 (1875). Swan River. *Type*, B.M. no. 43. 8 21. 3.
Notomys gouldi, Thos. P. Z S. 1906, p 767.

Hab. Western Australia (Salt R., Dwaladine, Stockpool, Albany).

Type. B.M. no. 7. 1. 1. 135.

Size rather small; hind foot about 36 mm.; skull attaining 32·5 mm, in greatest length. Palatal foramina and choanæ narrow.

The common West-Australian species, found in some numbers there by Shortridge in 1906.

4. *Notomys macrotis*, sp. n.

Hapalotis macrotis, Gerrard, Cat. Bones Mamm. B.M, p. 171 (1862) (nom. nud.); Gould, Mamm. Austr. i., Introd. p. xxxv (1863) (nom. nud.).

Very similar to *N. gouldi*, but larger, the hind foot about

40 mm., the skull some 2 or 3 mm. larger than in that animal. Fur rather coarser. Colour apparently similar. Interorbital space comparatively broad. Palatal foramina large, open, about 2·6 mm. in breadth as compared with 1·8 in *gouldi*. Choanæ also markedly broader, nearly 3 mm. in breadth. Orthodont; incisive index of type 68°.

Dimensions of type:—

Head and body (as originally stuffed) 118 mm.; tail (imperfect); hind foot 40·5; ear 26.

Skull: upper length from back of parietals 30; length of nasals 12·5; interorbital breadth 6·1; palatilar length 14; palatal foramina 6·5 × 2·6; upper molar series 5·5.

Hab. "Interior of Western Australia, on Moore's River."

Type. Adult skin with imperfect skull. B.M. no. 44.7.9.14, the skull formerly registered as 44. 10. 15. 2. Collected by John Gilbert, and received with the Gould Collection.

This species was rightly distinguished by Gray from *N. gouldi*, but never described. I use, however, the suitable name he selected for it.

It is readily distinguishable by its large and open palatal foramina.

Two specimens of it are in the Museum. One, the type, has its skull comparatively perfect, the back of the brain-case only being gone. In the other, a skin also received in the Gould Collection, the middle portion of the skull is alone present, but this is enough to show the characteristic palatal foramina and choanæ.

5. *Notomys mitchelli*, Og.

Dipus mitchelli, Ogilb. Trans. Linn. Soc. xviii. p. 130 (1841).

Size comparatively small, the hind foot about 33 mm., the skull about 30 mm. in total length. Colour fawn above, whitish below. Tail long, pencilled, bicolor.

Skull of average Murine proportions. Palatal foramina rather small. Choanæ not specially widened. Bullæ rather large. Incisors markedly opisthodont, the incisive index about 54°.

Hab. Interior of Australia, ranging over a wide area from the Northern Territory (Alroy), through Central Australia (Killalpanima, Lake Eyre), to Western New South Wales. Type-locality Reedy Plains, near the junction of the Murray and Murrumbidgee.

Type in the Sydney Museum.

The common species over the greater part of Central and Northern Australia. Distinguished by its opisthodont incisors and narrow choanæ.

The following appears to be (or, more probably, to have been) a definable subspecies of *N. mitchelli*:—

5 *a*. *Notomys mitchelli macropus*, subsp. n.

Essential characters of true *mitchelli*, but the feet longer and the fur longer and thicker; hairs of back about 8–9 mm. General colour more bluey-grey, not so brown as in *mitchelli*; the type, however, considerably faded. Under surface whitish with slaty bases. Feet more thickly haired than in *mitchelli*, white. Tail well-haired, pencilled, prominently bicolor.

Skull of type, so far as remains, as in *mitchelli*.

Dimensions of the type (measured on skin):—

Head and body 120 mm.; tail 153; hind foot 37; ear (wet) 26.

Skull: nasals 11·3; interorbital breadth 5·1; palatilar length 14; palatal foramina 6·2; upper molar series 5·1.

Hab. South Australia—believed to be Kangaroo Island.

Type. Adult. B.M. no. 55. 12. 34. 361. Collected by Dr. J. B. Harvey, who then lived in Kangaroo Island, and presented by him in 1841 to the Zoological Society's Museum. One specimen only.

6. *Notomys aquilo*, sp. n.

A small pale species with thin fur.

Size slightly less than in *mitchelli*. Fur thin, poor, not woolly. General colour pale sandy brown above, white below, the hairs white to their bases. A well-marked neck-gland present in the type. Feet thinly haired, flesh-coloured. Tail sandy brown, not conspicuously bicolor proximally.

Skull delicately built. Interorbital region flat, more parallel-sided than usual, less quickly broadening posteriorly. Lacrymal bones unusually large in the type, though this may be mainly due to age. Palatal foramina fairly large, well open. Anterior end of mesopterygoid fossa narrow, parallel-sided. Molars small. Incisors more or less orthodont, index of type 70°.

Dimensions of the type (measured on skin):—

Head and body 108 mm.; tail (imperfect); hind foot (wet) 35; ear (wet) 16.

Skull: back of parietals to front of nasals 26·3; nasals 11·2; interorbital breadth 5·2; palatilar length 13·2; palatal foramina 5·8; breadth of mesopterygoid fossa anteriorly 1·6; upper molar series 5.

Hab. Cape York, N. Queensland.

Type. Old male with worn teeth. B.M. no. 67. 9. 17. 2. Purchased of the dealer Higgins; collected by J. T. Cockerell.

This small northern species has the orthodont incisors of *cervinus* and the narrow choanæ of *mitchelli*, but is clearly distinct from both. It seems to be the only *Notomys* that occurs on the eastern coast of Australia, all the others being from west of the Dividing Range.

7. *Notomys cervinus*, Gould.

Hapalotis cervinus, Gould, P. Z. S. 1851, p. 127.

Size small; colour usually pale. Skull of about the size of that of *N. mitchelli*, but the palatal foramina larger and more open, the mesopterygoid fossa broader anteriorly, the bullæ smaller and the incisors orthodont, index about 75° to 77°, those of *N. mitchelli* being decidedly opisthodont.

Hab. The desert-region of Central Australia. Type from about 29° 6′ S., 141° E.

Type (lectotype). B.M. no. 53. 10. 22. 7. Collected 26th March, 1845, by Capt. Charles Sturt. From the Gould Collection.

This species and *N. mitchelli* occur together over a large area of Central Australia, and are often found in the same localities.

Finally, Gould's "*Hapalotis conditor*" is possibly[*] a member of this genus, but there is no specimen of it in the British Museum, and species belonging to several genera were included in what he called "*Hapalotis*."

There is, however, the skull of a quite distinct *Notomys* in the collection, but, pending the discovery of any authentic specimen of *conditor*, I will neither definitely assign it to that species, nor, on the other hand, describe it as new.

LII.—*Fossil Arthropods in the British Museum.*—VII.

By T. D. A. Cockerell, University of Colorado.

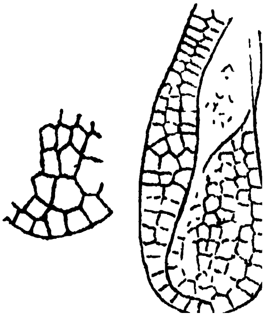
A new lot of Burmese amber, presented to the Museum by Mr. Swinhoe, contains only one insect which I am prepared to describe, though there is a very interesting Psychodid fly which I hope Mr. Edwards will find time to investigate. The one insect is, however, of unusual interest, being a bee. It is closely allied to a species occurring in Sicilian amber, which is Middle Miocene. The other fossils now described are from the Gurnet Bay Oligocene.

HEMIPTERA. (HETEROPTERA.)

Celantia (?) *seposita*, sp. n. (Tingididæ.) (Fig. 1.)

Tegmina or elytra rather narrow, 2·9 mm. long, formed nearly as in *Celantia vagans*, Distant, but with the anterior costal region flattened, with one less row of cells. As preserved it is reddish, but this may be due to an iron stain.

Fig. 1.



Celantia (?) *seposita*, sp. n.

Gurnet Bay Oligocene, Isle of Wight, Hooley 134.

Hooley 572 is the same species.

This is not like any British species of to-day, and while it probably is distinct from the Oriental genus *Celantia*, the differences are rather insignificant.

Tingis quinquecarinata, Berendt, from Baltic amber, is entirely different. It does not appear to belong to the Florissant genus *Eotingis*, to which it has been referred. The tegmina agree in character with those of the genus *Phatnoma*, Fieber, but the thorax differs.

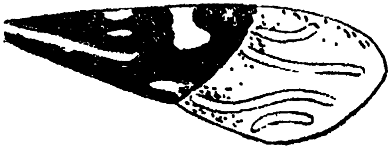
Lygæites amabilis, sp. n. (Lygæidæ.) (Fig. 2.)

Tegmen somewhat over 2 mm. long, beautifully marked, as shown in the figure. The corium has white marks on a black ground; the membrane is light reddish brown, with four curved, broad, white lines.

Gurnet Bay Oligocene, Isle of Wight, Hooley 1398.

I place this in *Lygæites*, a name devised for fossil Lygæids of uncertain generic position, because I do not like to propose a new genus from the tegmen alone. The markings on the corium show a certain resemblance to those of *Polyerates*, while those on the membrane can be seen suggested, much more faintly, in *Ligyrocoris*.

Fig. 2.



Lygæites amabilis, sp. n.

There is a slight superficial resemblance to the Reduviid genus *Prostemma*, species of which I saw in the British Museum.

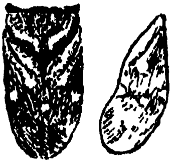
Similar markings on the membrane are faintly shown in *Zeridoneus costalis* (Van Duzee).

Lygæites acourti, sp. n. (Lygæidæ?.) (Fig. 3.)

Width 4 mm.; length of scutellum 3·2 mm.; base of scutellum to apex of membrane 7·5 mm.

Scutellum coarsely but not very densely punctured, the punctures on disc more or less in transverse rows, those near

Fig. 3.



Lygæites acourti, sp. n.

the sides denser and coarser; a pair of oblique, more or less semilunar, pale bands, their concave faces directed toward lateral margins; corium punctured, with inner margin, next to scutellum, pallid; several more or less evident round pale spots, a pair at each side of apex of scutellum, nearly midway between it and outer margin; one in middle line, nearly 2 mm. beyond end of scutellum; one on each side, laterad of and a little posterior to this; and one marginal. The membrane is dark, with fine parallel veins connected by cross-veins.

Gurnet Bay Oligocene (Brodie collection). I. 8658.

The scutellar markings recall those of *Œdancala dorsalis* (Say), but what can be seen of the membrane suggests a Coreid rather than a Lygæid.

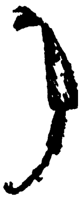
HYMENOPTERA.

Meliponorytes (?) *devictus*, sp. n. (Meliponidæ.) (Fig. 4.)

♀.—Length about 5·7 mm.

Robust, black, the abdomen brownish, mandibles ferruginous; anterior tarsi and small joints of the others ferruginous. Eyes red, not hairy; head broad; ocelli large and distinct, in a curve on vertex; antennæ considerably below middle of eyes, 12-jointed, scape long, curved; second joint moderately elongate; flagellum thick, rather short; mesothorax elevated, distinctly gibbous in front; scutellum convex, with a posterior projecting edge; head and thorax almost hairless, but there are scanty hairs on thorax above and rather long hairs on apical part of scutellum; femora robust; tibiæ robust, the posterior ones broadened and flattened, but less so than in *Trigona*; hind basitarsi large; abdomen short and obtuse, not hairy. Wings clear hyaline, with very large pale ferruginous stigma; marginal nervure apparently failing to reach wing-margin. Claws simple, pulvilli distinct.

Fig. 4.



Meliponorytes (?) *devictus*, sp. n. Hind leg.

In a bead of clear pale Burmese amber from the Hukong Valley, received from Mr. R. C. J. Swinhoe. Brit. Mus. In. 20702.

The details of the venation cannot be seen until the amber is suitably cut, but the insect appears to agree very well with the genus *Meliponorytes*, Tosi, from Sicilian amber. It is larger than *M. succini*, Tosi, and the stigma is more robust (less lanceolate), but the structure of the head, anterior legs, thorax, and many other features agree. The upper section of the basal nervure is directed downward as in *M. succini*. One hind tibia is surrounded by a whitish mass, which may have been pollen. The abdomen shows no trace of a ventral scopa. The cutting-edge of the mandibles appears to be quite simple.

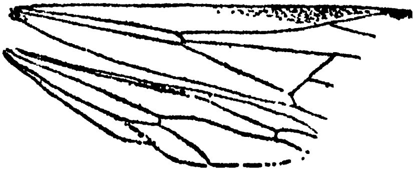
This bee can be regarded as directly ancestral to modern *Trigona*, which abounds to-day in the tropics of both hemispheres.

Polybia oblita, sp. n. (Vespidæ.) (Fig. 5.)

Thorax a little over 5 mm. broad; anterior wing, from base to stigma, 14 mm.; length of basal nervure 8 mm.; length of hind wing about 12 mm.

Venation as shown in figure.

Fig. 5.



Polybia oblita, sp. n.

Oligocene of Gurnet Bay, Isle of Wight (*a'Court Smith*). On a piece of rock, about 5 mm. from a fragment of *Typha*. Brit. Mus. In. 20530, and the reverse In. 17166.

The acute basal angle of first submarginal cell and the distinct arching of anal cell of hind wing indicate *Polybia* rather than *Polistes*. It is much larger than *P. anglica*, Ckll., already described from Gurnet Bay.

ERRATA.

In the fifth paper of this series [Ann. & Mag. N. H. (9) vii. 1921, p. 24] the smaller figure under *Rhodites vetus* is from a recent insect, and shows the morphology of the submarginal cell. In some of my earlier papers on the Gurnet Bay fossils I cited the British Museum numbers without the I. or In., which in every case should be prefixed.

LIII.—*New or little-known* Tipulidæ (*Diptera*).—VII. *Australasian Species*. By Charles P. Alexander, Ph.D., Urbana, Illinois, U.S.A.

The species of crane-flies discussed in this instalment are mainly from North Queensland, and were received through the kindness of Mr. Alan P. Dodd and Dr. James F. Illingworth. Mr. Edwards has sent me for study a few specimens from Fiji, presented by the Imperial Bureau of Entomology, and a few additional species from Tasmania. I am very deeply indebted to the above-named gentlemen for the privilege of studying these specimens. The types are preserved in the collection of the writer, except where stated to the contrary.

Dicranomyia (*Thrypticomyia*) *microstigma*, sp. n.

General coloration dark brown; vertex silvery grey; legs dark brown, the tarsi white, the basal third of the metatarsi dark brown; wings nearly hyaline, very slightly darkened apically; stigma very small; *Sc* short, Sc_1 terminating a distance before the origin of *Rs* that is approximately as long as the basal deflection of Cu_1.

Female.—Length about 5·5 mm.; wing 5 mm.

Rostrum obscure yellowish testaceous; palpi dark brown. Antennæ dark brown, the terminal pedicels of the flagellar segments conspicuous, nearly one-half as long as the basal enlargement. Head with the vertex clear silvery grey.

Mesonotum brown, the humeral regions and lateral margins of the præscutum slightly paler. Pleura obscure brownish yellow. Halteres elongate, brown. Legs with the coxæ and trochanters testaceous; femora and tibiæ dark brown; tarsi white, the basal third or slightly less of the metatarsi dark brown. Wings nearly hyaline, the apex beyond cell 1st M_2 very faintly clouded; stigma small, brown; veins dark brown. Venation: *Sc* very short for a member of this subgenus, Sc_1 ending far before the origin of *Rs*, the distance being as long as or longer than the basal deflection of Cu_1; Sc_2 some distance from the tip of Sc_1, the latter alone from one-half to two-thirds the basal deflection of Cu_1; *Rs* strongly arcuated to subangulate at origin; supernumerary cross-vein in cell Sc_1 rather indistinct, slightly variable in position; inner end of the elongate cell 1st M_2 about in alignment with the inner end of cell R_3; cell 1st M_2 about as long as the longest veins issuing from it; basal deflection of Cu_1 beyond mid-length of cell 1st M_2.

Abdominal tergites dark brown; sternites greenish testaceous.

Hab. North Queensland.

Holotype, ♀, Kuranda, Cairns District, altitude 1100 feet, April 1921 (*A. P. Dodd*).

Paratype, ♀, Gordonvale, March 1921 (*A. P. Dodd*).

"Holotype on tree-trunk; paratype on spider-web."

Dicranomyia whitei, sp. n.

General coloration dark brownish black, the thoracic pleura pruinose; wings nearly hyaline, the stigma conspicuously dark brown; Sc_1 ending a short distance beyond the origin of *Rs*; abdomen dark brown, this colour including the hypopygium.

Male.—Length about 6·5 mm.; wing 8 mm.

Rostrum and palpi dark brownish black. Antennæ brownish black throughout; flagellar segments oval, becoming more elongate toward the end of the organ. Head brownish grey.

Thorax very deep, the mesonotum unusually convex and gibbous. Mesonotal præscutum dark brownish grey, without distinct stripes, the median area more brownish, these passing into grey on the sides of the sclerite; remainder of the mesonotum more pruinose. Pleura dark with a grey pruinosity. Halteres not unusually elongated, dark brown, obscure yellow at base. Legs with the coxæ brown; trochanters obscure yellow; remainder of the legs broken. Wings nearly hyaline; stigma conspicuous, dark brown; veins dark brown. Venation: Sc_1 ending a short distance beyond the origin of *Rs*, Sc_2 far from the tip of Sc_1, the latter alone only a little shorter than the basal deflection of Cu_1; *Rs* gently arcuated, about twice the deflection of R_{4+5}; cell 1*st* M_2 closed; basal deflection of Cu_1 at the fork of *M*.

Abdomen dark brown, including the hypopygium. Male hypopygium with the ventral pleural appendage very large, dark brown, the rostriform appendage on the inner face reddish brown, provided with two spines; dorsal pleural appendage comparatively small, gently arcuated, terminating in a long straight point.

Hab. Tasmania.

Holotype, ♂, Mangalore, September 25, 1912 (*A. White*).

Type in the collection of the British Museum (Natural History).

This species is dedicated to the collector, the late Mr. Arthur White.

Dicranomyia cairnensis, sp. n.

Mesonotal præscutum obscure yellow, the median area broadly shiny brownish black; a dorsal brown pleural stripe; wings tinged with brown; stigma a little darker brown, small, subcircular; *Sc* long, cell 1*st* M_2 closed.

Male.—Length (excluding head) 4 mm.; wing 5 mm.

Head broken in the type.

Mesonotal præscutum shiny obscure yellow, the median area broadly shiny brownish black; remainder of the mesonotum crushed in the type, appearing to be almost uniform brown, the scutellum a little paler. Pleura whitish testaceous, the dorsal region infuscated to produce a brown, dorsal, longitudinal stripe. Halteres brown. Legs with the coxæ and trochanters pale whitish testaceous; femora dark brown; remainder of the legs broken. Wings with a strong brown tinge; stigma small, subcircular, dark brown; veins dark brown. Venation: *Sc* long, Sc_1 ending about opposite four-fifths the length of the long *Rs*, Sc_2 at its extreme tip; *Rs* arcuated at origin; cell 1*st* M_2 relatively small, closed, pentagonal; basal deflection of Cu_1 immediately before the fork of *M*.

Abdomen dark brown, the sternites a little paler. Male hypopygium with the pleurites moderately stout, the pleural appendage of each side produced proximad into a long, slender, chitinized arm, the tips decussate across the median line; penis-guard yellow.

Hab. North Queensland.

Holotype, ♂, Kuranda, Cairns District, altitude 1100 feet, April 1921 (*A. P. Dodd*).

"Ex scrub."

Dicranomyia cairnensis bears a considerable resemblance to *D. sedata*, Alex. (North Queensland), differing chiefly in the wing-pattern and structure of the hypopygium.

Dicranomyia amicula, sp. n.

General coloration pale brownish yellow; legs light yellow, the terminal tarsal segments darkened; wings nearly hyaline, stigma pale brown; *Sc* long; cell 1*st* M_2 open by the atrophy of the outer deflection of M_3.

Female.—Length 3·6 mm.; wing 4·2 mm.

Rostrum and palpi light brown. Antennæ brown; flagellar segments oval. Head grey.

Mesonotum obscure yellow, the median area of the præscutum brown; scutum and postnotum sparsely pruinose;

scutellum yellowish apically. Pleura whitish, more plumbeous on the mesepisternum. Halteres pale, the knobs a little darker. Legs with the coxæ and trochanters pale; remainder of the legs light yellow, only the terminal tarsal segments infuscated. Wings nearly hyaline; stigma short-oval, pale brown; veins dark brown. Venation: *Sc* long, Sc_1 ending about opposite two-thirds the length of *Rs*, Sc_2 close to its tip; *Rs* straight, slightly bent near the extreme base; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 about one-third its length beyond the fork of *M*.

Abdomen light brown; sternites more yellowish. Ovipositor with the valves yellowish horn-colour; bases of the sternal valves conspicuously blackened.

Hab. North Queensland.

Holotype, ♀, Kuranda, Cairns District, altitude 1100 feet, April 1921 (*A. P. Dodd*).

"Ex scrub."

Dicranomyia opima, sp. n.

General coloration dark brown; mesonotal præscutum light clove-brown; pronotum and a narrow dorsal pleural line yellow; front and anterior part of vertex silvery; wings faintly tinged with brown, heavily spotted with dark brown; *Sc* very long.

Male.—Length 4–5 mm.; wing 4·8–6 mm.

Rostrum and palpi dark brown. Antennæ dark brown throughout; basal flagellar segments large, nearly globular, the segments gradually passing into oval-cylindrical toward the end of the organ; verticils long and conspicuous. Head brown; front and anterior part of vertex conspicuously silvery white.

Pronotum conspicuous light yellow. Mesonotal præscutum clear light clove-brown without markings, the lateral margins narrowly light yellow; remainder of mesonotum dark brown. Pleura dark brown, this including the propleura; dorsal pleural region narrowly yellow. Halteres dark brown, the base of the stem yellow. Legs with the fore coxæ brown; mid-coxæ brown, the tips slightly yellowish; posterior coxæ yellow; trochanters yellowish testaceous; remainder of the legs brown. Wings with a faint brown tinge, heavily marked with dark brown as follows: a blotch before the pale arcular region; bases of cells *R* and *M* occupied by a large blotch; large areas at origin of *Rs*, tip of R_1, and at the ends of the anal veins; a conspicuous band across the wing along the cord, extending from the end of vein *Sc* to the end of Cu_2; outer end of cell *1st* M_2 similarly seamed; wing-tip broadly darkened; a similar brown seam along vein *Cu*; veins dark brown. Venation: *Sc* very long, Sc_1 ending beyond the fork of *Rs*, Sc_2 at tip of Sc_1; *Rs* very strongly arcuated at origin; *r* from one to one and one-half times its length from the tip of R_1; cell *1st* M_2 relatively large, closed; basal deflection of Cu_1 at the fork of *M*; Cu_2 from two-thirds to four-fifths of the basal deflection of Cu_1; anal veins strongly curved proximad at tips.

Abdominal tergites dark brownish black; sternites black, the segments ringed caudally with yellowish or greyish; hypopygium dark.

Hab. North Queensland.

Holotype, ♂, Gordonvale, Cairns District, January 1921 (*A. P. Dodd*).

Paratopotypes, 4 ♂ ♂.

"On fungus in scrub."

Dicranomyia opima belongs to the peculiar group of the genus typified by the West African *D. recedens*, Alex., and *D. recurvans*, Alex., and the Sumatran *D. trigonia* (Edw.). The collector's notes would suggest that the larvæ might be found in fungi.

Limnobia emacerata, sp. n.

General coloration yellow; thoracic pleura with a conspicuous, longitudinal, brown stripe; legs brownish yellow throughout; wings with a faint grey tinge, stigma subcircular, dark brown; abdominal segments yellow, the apical half of the tergites dark brown; hypopygium yellowish.

Male.—Length 5 mm.; wing 5·3 mm.

Rostrum and palpi yellow. Antennæ dark brown throughout, flagellar segments oval. Head greyish brown; eyes of male large.

Mesonotal præscutum yellow, the median area behind a little darkened; scutum yellow, the scutal lobes suffused with brown; remainder of mesonotum yellow. Pleura yellow with a conspicuous, brown, longitudinal stripe beginning at the cervical sclerites, passing above the fore coxæ and beneath the halteres to the base of the abdomen. Halteres pale, the base of the knob a little infuscated, the apices of the knobs conspicuously yellow. Legs with the coxæ and trochanters yellow; remainder of the legs pale brownish yellow. Wings with a faint grey tinge; stigma subcircular, dark brown; veins dark brown. Venation: *Sc* long, Sc_1 ending about opposite two-thirds the length of *Rs*, Sc_2 at the tip of Sc_1; *Rs* long, gently arcuated; *r* at the tip of R_1; cell 1*st* M_2 elongate, slightly widened distally; *m* and the outer deflection of M_3 subequal; basal deflection of Cu_1 a short distance beyond the fork of *M*; Cu_2 a little shorter than the basal deflection of Cu_1.

Abdominal tergites with the basal half of the segments obscure yellow, the apical half dark brown to give the organ an annulated appearance; sternites somewhat similar, but the colours less distinct; hypopygium and penultimate segment yellowish.

Hab. North Queensland.

Holotype, ♂, Gordonvale, Cairns District, February 1921 (*A. P. Dodd*).

"Ex leaf in scrub."

Limnobia semiermis, sp. n.

General coloration yellow; mesonotal præscutum with three brown stripes; femora light brown with a darker brown subterminal ring; wings subhyaline; stigma elongate, brown; *Sc* long; abdominal segments brown, the apical fourth of each segment yellow.

Male.—Length 6·8 mm.; wing 8 mm.

Rostrum and palpi dark brown. Antennæ with the basal segment dark brown basally, the apical half pale brown; flagellar segments dark brown, short-oval, each segment clothed with conspicuous white pubescence. Front narrow, light cream-yellow; vertex brown and obscure yellow interspersed.

Pronotum yellow, dark brown medially. Mesonotal præscutum obscure yellow with three dark brown stripes; remainder of mesonotum brownish testaceous. Pleura yellowish testaceous, indistinctly variegated with darker. Halteres pale. Legs with the coxæ and trochanters yellow; femora yellow basally, gradually passing into light brown; a conspicuous brown subterminal ring preceded by a very indistinct pale annulus, the extreme tips very narrowly yellow; tibiæ and tarsi light brown; posterior tibiæ longer than the tarsi. Wings subhyaline, cells *C* and *Sc* indistinctly yellow; stigma large, elongate, brown; origin of *Rs* and the cord very indistinctly seamed with pale brown; veins brown. Venation: *Sc* long, S_1 ending nearly opposite *r–m*, S_2 a short distance from the tip of S_1; *Rs* gently arcuated; *r* at tip of R_1, strongly angulated near mid-length; deflection of

R_{4+5} about equal to *m*; cell *1st* M_2 elongate, rectangular; *m* arcuated, longer than the outer deflection of M_3; basal deflection of Cu_1 at about two-fifths the length of cell *1st* M_2.

Abdominal segments dark brown with about the apical quarter of each conspicuously yellow; hypopygium yellow. Male hypopygium armed with four partly chitinized appendages, the genital chamber open.

Hab. North Queensland.

Holotype, ♂, Kuranda, Cairns District, altitude 1100 feet, April 1921 (*A. P. Dodd*).

"Ex leaf in scrub."

Limnobia (?) *dactylolabis*, sp. n.

Antennæ black; mesonotal præscutum obscure orange; pleura whitish testaceous with two narrow brown longitudinal stripes; wings hyaline, stigma oval, dark brown; Sc_1 ending before mid-length of *Rs*; cell *1st* M_2 closed; male hypopygium with a single pleural appendage appearing as a long, slender, curved, blackened rod.

Male.—Length about 4·6 mm.; wing 5·2 mm.

Rostrum and palpi dark brown. Antennæ moderately elongate for a member of this genus; first segment pale, remainder of organ black; flagellar segments oval with a short, shiny pedicel. Head brownish orange, darker adjoining the margin of the eyes.

Pronotum orange-brown. Mesonotal præscutum obscure orange, unmarked; remainder of the mesonotum orange-brown. Pleura whitish testaceous with two narrow, brown, longitudinal stripes, the more dorsal passing beneath the root of the halteres, the ventral stripe occupying the sides of the mesosternum and extending from fore to the middle coxæ. Halteres long and slender, dark brown, the base of the stem paler. Legs with the coxæ testaceous, the outer faces slightly infumed; trochanters testaceous; remainder of the legs broken. Wings hyaline; stigma small, oval, dark brown; veins dark brownish black. Venation: *Sc* moderately long, Sc_1 ending before mid-length of *Rs*, Sc_2 some distance from its tip, S_1 alone about two-thirds the basal deflection of Cu_1, a little longer than the first section of M_{1+2}; *Rs* long, strongly arcuated at origin; *r* at tip of R_1 and near two-fifths the length of R_{2+3}; cell *1st* M_2 closed, rather small, pentagonal; basal deflection of Cu_1 at, or a short distance before, the fork of *M*; vein *2nd A* close to the wing-margin, cell *2nd A* being linear.

Abdominal segments dark brown, paler caudally; basal sternites more extensively pale. Male hypopygium with the pleurites broad-based, narrowed apically; a single pleural appendage that is longer than the pleurite, appearing as a pale broad base that narrows into a long, slender, black rod that is bent proximad. On the inner face of each pleurite is a small blunt lobe set with abundant setæ.

Hab. Fiji.

Holotype, ♂, Mountain, Laŭtoka, 11. 4. 1920 (*H. Greenwood*).

Type in the collection of the British Museum (Natural History).

Limnobia (?) *dactylolabis* is an aberrant member of the genus, and might well be considered as representing a distinct subgeneric group.

Limnobia (?) *teucholabina*, sp. n.

Head yellow; antennæ obscure yellow, four intermediate flagellar segments dark brown; mesonotal præscutum with three confluent obscure orange-yellow stripes; pleura dark brown; legs yellow, femora narrowly tipped with white and with a broad brown subterminal ring; wings subhyaline, sparsely spotted with brown, this including a series of spots along the margin at the ends of the longitudinal veins; *Sc* long, Sc_2 at the tip of Sc_1.

Female.—Length 3·8 mm.; wing 4·3 mm.

Rostrum a little pronounced, about two-thirds the remainder of the head; rostrum and palpi black. Antennæ apparently with fourteen segments; basal flagellar segments obscure yellow, terminal two or three segments yellow, the four intermediate segments before this yellow apex conspicuously dark brown. Head bright yellow, the centre of the vertex shrunken, apparently slightly darker in colour.

Pronotum pale yellow. Mesonotal præscutum with three confluent obscure orange-yellow stripes, narrowly margined laterally with silvery; humeral region and lateral margins obscure yellow; scutum obscure testaceous, the centres of the lobes brown; scutellum obscure yellowish testaceous; postnotum pale with two dark spots at the posterior margin. Pleura dark brown. Halteres brown, the knobs broken. Legs with the coxæ dark brown, the tips conspicuously whitened; trochanters white; femora yellow, the tips rather narrowly but conspicuously white; a broad dark brown subterminal ring, about four times as broad as the pale apex; tibiæ and tarsi yellow, the terminal tarsal segments darkened; tarsal claws long, simple; empodia distinct. Wings subhyaline, sparsely spotted with brown; a conspicuous brown area at the stigma, continued caudad along the cord as a seam; a brown seam at *m*; conspicuous brown spots at the wing-margin at the ends of veins R_{2+3}, R_{4+5}, M_{1+2}, M_3, Cu_1, Cu_2, and the anal veins; small brown spots at arculus, origin of *Rs* and Sc_2; veins pale yellow, brown in the infuscated areas. Venation: somewhat as in the genus *Teucholabis*; *Sc* long, Sc_1 ending a little beyond mid-length of *Rs*, Sc_2 at the tip of S_1; *Rs* long, gently arcuated; *r* about its length beyond the fork of *Rs*; R_1 beyond it about one-half of *r*; deflection of R_{4+5} feebly angulated at mid-length; R_{2+3} and R_{4+5} diverging at wing-margin, so cell R_3 is trumpet-shaped; cell 1*st* M_2 very long, longer than *Rs* or any of the veins beyond it; *m* less than one-half the outer deflection of M_3; *r–m* on M_{1+2} about its own length beyond the fork of *M*; basal deflection of Cu_1 just beyond the fork of *M*.

Abdomen dark brown, the subterminal tergites conspicuously yellow. Ovipositor with the valves yellow, flattened, upcurved to the acute tips.

Hab. Fiji.

Holotype, ♀, Mountain, Laŭtoka, 11.4.1920 (*H. Greenwood*).

Type in the collection of the British Museum (Natural History).

Limnobia (?) *teucholabina* is a species of very doubtful generic position. The type-specimen is a female in indifferent condition. Mr. Edwards had arranged the fly in the genus *Teucholabis*, which it resembles in a rather striking manner, but there seem to be but fourteen antennal segments. Until more material is available, it seems best to place this very interesting fly as an aberrant *Limnobia*, with the indication that it will probably be found to represent a new generic or subgeneric group when more specimens come to hand.

Libnotes subæqualis, sp. n.

General coloration yellow, pronotum and mesonotal præscutum with a median darker stripe; tips of femora pale; wings greyish yellow, the costal and stigmal regions more strongly yellowish; *Rs* short, straight, in alignment with the remaining elements of the cord; abdominal tergites bicolorous.

Male.—Length 8 mm.; wing 9 mm.

Rostrum and palpi brown. Antennæ dark brown. Head dark brown, narrowly yellowish silvery adjoining the margin of the eyes.

Pronotum yellow, dark brown medially. Mesonotal præscutum with a narrow brown median stripe, the lateral margins broadly obscure yellow; remainder of mesonotum sunshiny yellowish brown. Pleura reddish yellow. Halteres yellow, the knobs dark brown. Legs with the coxæ and trochanters testaceous; femora brownish testaceous, passing into a darker subterminal ring, the apices narrowly obscure yellow; tibiæ and tarsi brown, the terminal segments of the latter darker. Wings greyish yellow, cells *C*, *Sc*, *1st* Sc_1, *2nd* Sc_1, *1st* R_1, and along vein *Cu* strongly yellowish; stigma and a seam along the supernumerary cross-vein in cell Sc_1 strongly seamed with brown; an indistinct and narrow infuscation along cord; veins brown. Venation: *Sc* short, Sc_1 extending to just beyond the fork of *Rs*, Sc_2 a short distance from the tip of Sc_1, beyond the origin of *Rs*; a supernumerary cross-vein in cell Sc_1 more than its length before *r*; the veins forming the cord (*Rs*, deflection of R_{1+5}, *r–m*, and deflection of M_{1+2} all subequal in length); veins R_{2+3} and R_{4+5} both turned strongly caudad beyond two-thirds their length; cell *1st* M_2 elongate, subrectangular; *m* about one-half longer than deflection of M_3; basal deflection of Cu_1 before mid-length of cell *1st* M_2.

Abdominal tergites indistinctly bicolorous, the basal half of each segment dark brown, the broad caudal margin obscure yellow; sternites obscure brownish yellow.

Hab. North Queensland.

Holotype, ♂, Green hills near Cairns, December 7, 1920 (*J. F. Illingworth*).

"In scrub on leaves near stream."

Libnotes subæqualis is closest to *L. samoënsis*, Alexander (Samoa), differing chiefly in the venational details, *i. e.*, the longer Sc_1, short and straight *Rs*, position of the supernumerary cross-vein in cell Sc_1, the small cell *1st* M_2, and the stronger caudal deflection of the branches of the sector.

Amphineurus minusculus, sp. n.

Size small (wing, ♂, under 4 mm.); head grey; thoracic pleura with two broad, brown, longitudinal stripes that enclose a slightly wider light grey area; knobs of the halteres whitish; femora and tibiæ yellow; wings tinged with brown, the macrotrichiæ white and dark brown.

Male.—Length 3–5 mm.; wing 3·8 mm.

Rostrum and palpi brown. Antennæ comparatively short for a member of this group, if bent backward not attaining the wing-root; scapal segments brown, basal flagellar segments obscure yellow; intermediate segments indistinctly bicolorous, the basal half of each segment being infuscated; terminal flagellar segments uniformly infuscated; flagellar segments subcylindrical. Head dull grey.

Mesonotum light greyish brown, unmarked. Pleura clear grey, bordered above and beneath by a broad, dark brown, longitudinal stripe, the dorsal stripe beginning at the cervical sclerites, passing above the root of the halteres to the abdomen; ventral stripe occupying the sides of the mesosternum; the dark stripes only a little narrower than the grey stripe enclosed. Halteres dark brown, the base of the stem yellowish, the knobs whitish. Legs with the coxæ pale, the basal half infuscated; trochanters yellowish testaceous; femora and tibiæ yellow, the femoral bases a little darkened; tarsi brown. Wings with a strong brown tinge, the stigmal region darkened; veins brown; macrotrichiæ on wing-surface mostly pale, those along the cord, at origin of *Rs* and less distinctly elsewhere on wing dark brown, the effect produced being a very indistinct mottling. Venation: Sc_1 ending opposite *r*, Sc_2 immediately beyond the origin of *Rs*; R_{2+3} at a marked angle to the end of *Rs*, about twice as long as the deflection of R_{4+5}; *r* immediately before the fork of R_{2+3}.

Abdomen light brown, the lateral margins of the tergites broadly and conspicuously velvety black; sternites pale brownish yellow. Male hypopygium large and complicated.

Hab. North Queensland.

Holotype, ♂, Kuranda, Cairns District, altitude 1100 feet, April 1921 (*A. P. Dodd*).

"Ex scrub."

Gnophomyia gloria, sp. n.

General coloration black with steel-blue reflections; head and thoracic pleura with a blue-grey bloom; legs dark brown, the bases of the tarsi yellow; wings dark brown, cross-banded with whitish hyaline, the extreme wing-tip narrowly darkened; cell 1*st* M_2 sessile to short-petiolate.

Male.—Length 4·4–5 mm.; wing 4·7–5 mm.

Female.—Length 5·4–6·2 mm.; wing 4·8–5·5 mm.

Coloration generally similar in the two sexes, in this respect differing from the two other members of this group, *G. fascipennis* (Thoms.) and *G. cyanoceps*, Alex.

Rostrum and palpi dark brownish black. Antennæ dark brown, first scapal segment pruinescent above; second scapal segment elongate-pyriform, pale basally. Head with a clear blue-grey pruinosity.

Mesonotum black with brilliant steel-blue reflexions. Pleura with a shimmering blue-grey pruinosity. Halteres dark brown. Legs with the coxæ black, sparsely pruinose; trochanters obscure yellow; femora and tibiæ dark brown, the former pale basally; first and second segments of the tarsi obscure yellow, narrowly tipped with dark brown; remainder of the tarsi dark brown. Wings dark brown, conspicuously cross-banded with whitish hyaline, these pale areas arranged as follows: Wing-base to the level of the arculus; a large quadrate area in cells *R* and *M* before the origin of *Rs*, together with a similar but smaller isolated area near the outer end of cell *2nd A*; a conspicuous band immediately before the cord, this extending entirely across the wing, although more yellowish in cell Sc_1, of nearly equal width throughout; the terminal band is lunate with the convexity lying distad, this band being close to the wing-apex, extending from cell R_2 through cell M_3; wing-tip in cells R_2, R_3, R_5, and *2nd* M_2 narrowly darkened; veins dark, paler in the white areas. Venation: Sc_1 ending about opposite mid-length of *Rs*, Sc_2 some distance from the tip of Sc_1; *Rs* long, almost straight; R_{2+3} about twice *r–m*; cell *1st* M_2 closed, comparatively small, rectangular; *m* very short to lacking, so cell *2nd* M_2 is narrowly sessile to short-petiolate; basal deflection of Cu_1 at near two-fifths the length of cell *1st* M_2.

Abdomen black with conspicuous blue and purple reflexions. Valves of the rather elongate ovipositor reddish horn-colour.

Hab. North Queensland.

Holotype, ♂, Gordonvale, Cairns District, February 1921 (*A. P. Dodd*).

Allotopotype, ♀.

Paratopotypes, 6 ♂ ♀ January 1921, 4 ♂ ♀ February 1921. "On foliage along edge of stream."

Gonomyia (*Leiponeura*) *terræ-reginæ*, sp. n.

General coloration dark brown, variegated with yellow; thoracic pleura striped brown and white; legs brown; wings rather broad, strongly tinged with greyish; *Sc* long, Sc_2 near tip of Sc_1; cell *1st* M_2 closed; male hypopygium with two fleshy pleural appendages; gonapophyses and penis-guard forming a complicated mass that projects beyond the level of the pleural appendages.

Male.—Length about 4 mm.; wing 4 mm.

Rostrum whitish; palpi brown. Antennæ dark brown; flagellar segments elongate, clothed with a long erect pubescence and a few long verticils. Head dark grey.

Pronotum white. Mesonotal præscutum dark brown with a sparse pollen; scutal lobes dark brown, the median area and caudal margin of the lobes yellow; scutellum dark brown anteriorly, broadly margined with light yellow; postnotum dark brown, sparsely pruinose. Pleura with a broad white ventral stripe; a conspicuous greyish-brown area on the mesepisternum, the mesepimeron pale. Mesosternum brown, sparsely pruinose. Halteres pale brown, the extreme base of the stem paler. Legs with the coxæ obscure yellow, the fore coxæ and base of middle coxæ darker; trochanters brownish testaceous; remainder of legs brown, the tips of the femora indistinctly darker. Wings rather broad, strongly tinged with greyish, the stigma very faintly indicated; veins brown. Venation: *Sc* of moderate length, Sc_1 extending to about opposite two-fifths the length of the long sector, Sc_2 a little more than its own length from the tip of Sc_1; *Rs* long, straight, with four macrotrichiæ, only the extreme base arcuated; cell R_3 trumpet-shaped; cell 1*st* M_2 closed; basal deflection of Cu_1 immediately before the fork of *M*.

Abdomen dark brown; sternites paler. Male hypopygium with the pleurites stout, the caudo-lateral angles produced caudad into stout fleshy lobes; two pleural appendages, both pale; the largest appendage is fleshy, a little longer than the pleural lobe but more slender, the surface with a few strong setæ, the tip with a very strong and powerful bristle; second pleural appendage small, triangular or conical in outline. Penis-guard and gonapophyses forming a large complicated mass that projects beyond the level of the pleural appendages, the guard curved, the extreme tip running out into a spine, the apophyses forming a large shield at the apex, the angles produced laterad into obtuse triangular points.

Hab. North Queensland.

Holotype, ♂, Gordonvale, September 1920 (*A. P. Dodd*). "Ex scrub."

Gonomyia terræ-reginæ is closest to the type of the subgenus, *G.* (*L.*) *skusei*, Alex. (*gracilis*, Skuse, preoccupied), differing in the small size and broad wings.

Trentepohlia (*Trentepohlia*) *media*, sp. n.

Male.—Length about 6 mm.; wing 5·3 mm.

Belongs to the group of *T. trentepohliæ*, in most of its characters intermediate between *trentepohliæ* (Wied.) and *speiseri* (Edw.).

Mesonotum shiny brownish yellow without distinct darker markings. Wings with the cord distinctly seamed with brown, this not including the extreme base of *Rs* or the base of cell *1st* R_1 as in *speiseri*; cells *C* and *Sc*, together with their veins, yellow. Wing-apex darkened, this including the entire cell R_2 as in *speiseri* and the distal part of cell *2nd* R_1; cells R_3, R_5, and M_2 of a slightly paler shade of brown, but still plainly infuscated. Petiole of cell R indistinctly seamed with brown, dividing the broad yellow anteapical cross-band. Venation: *Rs* shorter than the deflection of R_{4+5}.

Hab. North Queensland.

Holotype, ♂, Gordonvale, Cairns District, February 1921 (*A. P. Dodd*).

Paratopotype, ♂, January 1921.

"On foliage in scrub."

Lechria sublævis, Alexander.

1920. *Lechria sublævis*, Alexander; Mem. Queensland Mus. vol. vii. pt. 1, pp. 54, 55.

This interesting species was based on alcoholic material. The following details of coloration may be added from a series of five dried specimens [Gordonvale, North Queensland, January 1921 (*A. P. Dodd*); resting on trunks of *Eucalyptus* in forest]. Head and thorax with a clear blue-grey pruinosity, more brownish on the mesonotal præscutum. Femora yellow, the tips conspicuously and abruptly dark brown. Abdomen bicolorous, the segments dark brown basally, yellowish ochreous apically. This small series shows the following considerable range in size:—

Male.—Length 5·2–5·5 mm.; wing 6·5 mm.

Female.—Length 6·5–8 mm.; wing 6·4–8 mm.

Genus LIMNOPHILA, Macquart.

PARALIMNOPHILA, subgen. nov.

Antennæ with sixteen segments, the basal segments of the flagellum slightly enlarged at apex. Coxæ large; legs and tibial spurs bicolorous. Prosternum between fore coxæ very

narrow. Wings with arculus semiobsolete; R_1 conspicuously arcuated before tip; basal deflection of Cu_1 at or before the fork of M; *2nd Anal* vein sinuous.

Type of the subgenus:—*Limnophila leucophæta*, Skuse (Australia).

This new group is apparently related to *Dactylolabis*, Osten-Sacken, but shows some affinities with *Pseudolimnophila*, Alexander. The discovery of the male sex will be of interest.

Limnophila (Paralimnophila) leucophæta cairnensis, subsp. n.

Female.—Length 10 mm; wing 8·7 mm.

Similar to *L. leucophæta*, Skuse, differing as follows:—

Size slightly smaller. Pronotum and humeral region of præscutum yellowish. Thoracic pleura largely dark brown. Wings pale yellowish subhyaline, the costal cell brown, more yellowish at the tip; cell *Sc* largely yellowish; veins and cells conspicuously clouded with brown, distributed as follows:—Two subhyaline areas in cell *R* before the origin of *Rs*, these a little smaller than the dark area between; a pale area before the stigma; cell *1st* M_2 pale. Venation: Sc_1 extending to just beyond the fork of R_{2+3}, Sc_2 some distance from the tip of Sc_1, lying far before the fork of *Rs*, Sc_1 alone longer than the basal deflection of Cu_1; R_1 arcuated opposite *r*; *r* about twice its length before the tip of R_1 and on R_2 a distance about three times R_{2+3}; *Rs* very long; R_{2+3} shorter than the basal deflection of R_{4+5}; cell *1st* M_2 very small; basal deflection of Cu_1 before the fork of M a distance about equal to *r–m*.

Hab. North Queensland.

Holotype, ♀, Babinda, November 10, 1920 (*J. F. Illingworth*).

"On scrub leaves."

It is probable that more material will give the present form full specific rank.

Gynoplistia claripennis, sp. n.

General coloration shiny coal-black; thoracic pleura grey pruinose; femoral bases broadly yellow; a broad yellowish-white ring before the tips of the posterior tibiæ; wings hyaline, stigma brown; a faint brown cloud along the cord and at the wing-tip; hypopygium black, concolorous with the remainder of the abdomen.

Male.—Length 8·7 mm.; wing 8·3 mm.

Head, with appendages, black. Antennæ with seventeen segments, all flagellar segments but the terminal two being pectinate.

Mesonotum shiny black. Pleura black, grey pruinose. Halteres obscure brownish yelllow, the knobs dark brown. Legs with the coxæ black, greyish pruinose; trochanters black; remainder of the legs black, the femoral bases broadly yellow, on the fore legs including about the basal half, on the posterior legs including about the basal two-thirds; a broad yellowish-white ring before the tip of the tibia. Wings hyaline; cell *Sc* yellowish; stigma brown; a very faint brown clouding along the cord; wing-tip indistinctly darkened; veins dark brown. Venation: *Sc* long, Sc_1 ending opposite the fork of *Rs*, Sc_2 at the tip of Sc_1; *Rs* long, strongly arcuated at origin; R_{2+3} short, a little longer than *r–m*; cell M_1 present; petiole of cell M_1 about equal to the basal deflection of Cu_1, the latter at about one-third its length beyond the fork of *M*.

Abdomen shiny black, including the hypopygium.

Hab. Tasmania.

Holotype, ♂, Mt. Wellington, altitude 1300–2300 feet, January 15–February 6, 1913 (*R. E. Turner*).

Type in the collection of the British Museum (Natural History).

Gynoplistia doddi, sp. n.

Antennæ with twenty-four segments, all flagellar segments except the terminal two with long flabellate branches, basal three branches directed outward; tarsi black; wings grey, marked with dark brown; abdomen black, cross-banded with orange-yellow; a subterminal black ring; hypopygium orange.

Male.—Length 8·5 mm.; wing 8·4 mm.

Rostrum and palpi brown. Antennæ of the male large with very long flabellate pectinations; flagellum with twenty-two segments, of which all but the terminal two are pectinate; pectinations of the basal three segments directed outward (as in *G. vilis*); longest pectinations about one-half the length of the entire antenna; the 21st flagellar segment has a small spur near mid-length; scape and basal flagellar segments obscure yellow, the terminal segments and all the pectinations black. Head broad, dark brown.

Mesonotum and pleura brownish yellow without distinct markings. Halteres short, yellow, the knobs dark brown. Legs with the coxæ and trochanters yellow; femora yellow with a broad (1·5 mm.) black subterminal ring, the extreme apex pale; tibiæ black, the extreme base pale; tarsi black.

Wings with a faint grey tinge, marked with dark brown; cell *Sc* brown; a faint brown cloud in the base of cell *R*; a conspicuous quadrate area at the origin of *Rs*; a broad band occupying the space between the ends of vein Sc_1 and R_1, extending caudad to cell 1*st* M_2; both ends of cell 1*st* M_2 and the basal deflection of Cu_1 broadly seamed with brown; wing-apex broadly but indistinctly darkened, this coloration continued around the wing-margin into the anal cells; veins dark brown. Venation: *Rs* strongly angulated at origin, and more than twice its length from tip of R_1; inner end of cell R_3 far proximad of cell R_5; cell 1*st* M_2 relatively small, roughly quadrate in outline; basal deflection of Cu_1 at near three-fourths the length of cell 1*st* M_2.

Abdominal tergites black, the extreme base of each segment narrowly, the apex more broadly, orange-yellow; segments 6 and 7 entirely black; hypopygium orange; sternites obscure brownish yellow, the sixth and seventh segments black.

Hab. North Queensland.

Holotype, ♂, Yungaburra, Cairns District, altitude 2500 feet, April 1921 (*A. P. Dodd*).

"On leaf in scrub."

This very distinct *Gynoplistia* is dedicated to the collector, Mr. Alan P. Dodd, to whom I am indebted for many interesting Tipulidæ from North Queensland.

Ctenacroscelis fijiensis, sp. n.

General coloration yellow, heavily marked with brown; antennal flagellum fulvous; thoracic pleura variegated with brown; a pale dorso-pleural stripe continued caudad across the postnotum; femora with a conspicuous yellow subterminal ring, the tips broadly dark brown.

Female.—Length about 21 mm.; wing 23 mm.

Frontal prolongation of head obscure yellow above, the sides darker brown; palpi dark brown. Antennæ short; first scapal segment brown; second segment light yellow; flagellum fulvous. Head dark brown, narrowly yellow adjoining the inner margin of the eyes; vertical tubercle brown, margined with yellow.

Pronotum dark brown, narrowly yellowish medially. Mesonotal præscutum obscure yellow, this colour almost entirely hidden by conspicuous brown stripes; intermediate pair almost confluent; sublateral stripes elongate but considerably constricted on the outer margin opposite the pseudosutural foveæ, the anterior ends confluent internally with the intermediate stripes; lateral margins of præscutum of a darker brown than the four discal stripes, deflected strongly proximad at the pseudosutural foveæ, their anterior ends confluent with the sublateral stripes; extreme lateral and anterior margin of præscutum pale; scutal lobes dark; scutellum pale basally, the caudal margin dark; postnotum with a basal dark triangle, the apex directed backward, followed posteriorly by a pale yellow transverse stripe; caudal margin of postnotum narrowly darkened. Pleura grey, conspicuously variegated with brown, this not appearing as a distinct dorso-pleural stripe as in *C. conspicabilis*; a conspicuous light yellow dorso-pleural stripe passing beneath the wing-root across the postnotum as described above. Halteres broken. Legs with the coxæ grey; anterior coxæ with two longitudinal brown lines; mid- and hind coxæ with a single conspicuous brown blotch; trochanters yellow; femora brownish yellow, the apices broadly dark brown; a broad, conspicuous, yellow subterminal ring; tibiæ and tarsi brownish yellow. Wings with a strong brownish suffusion; stigma brown; a brown cloud at the fork of *Cu* and at *r–m*; veins brown. Venation as in the genus; the tip of R_3 bent strongly cephalad, so that cell *Rs* is abruptly widened outwardly.

Abdomen with the tergites dark brown, the lateral and caudal margins very narrowly pale yellow. Ovipositor with the valves horn-coloured.

Hab. Fiji.

Holotype, ♀, Labasa, October 1914 (*R. Veitch*).

Type in the collection of the British Museum (Natural History).

Ctenacroscelis fijiensis differs from the Australian *C. conspicabilis* (Skuse) in the stouter and differently coloured legs, the fulvous antennæ, and the pale dorso-pleural stripe that continues caudad across the mesonotal postnotum.

LIV.—*On some new small Mammals from East Africa.*

By P. S. Kershaw.

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◆

Elephantulus ocularis, sp. n.

A member of the *rufescens* group, with sternal gland, bicoloured short-haired tail of moderate length, and short sleek fur.

Colour of the head and back light fawn, between "ecru-drab" and "vinaceous cinnamon" (Ridgway), similar to *revoili* and *deserti*, but lacking the pinkish tone of those species. There is none of the red tint of *rufescens* and *pulcher*, which are its nearest northerly neighbours. Paler on the sides. The transition to the white of the under surface is less abrupt than in *rufescens* and its allies. White markings round the eye very large and conspicuous, and interrupted posteriorly by a streak of "mummy-brown." The white colour above the eye measures horizontally 23 mm., and vertically at the widest part behind the eye 4·7 mm. There is a white tuft at the base of the ear and a cinnamon patch behind it. Under surface in the type white, with slaty bases to the hairs except in an area between the thighs about 25 mm. longitudinally, where the bases of the hairs are white. This slaty colour is a variable character, strongly marked in some specimens and almost wanting in others, while in one (out of thirteen specimens examined) the hairs are white to their bases on the whole of the under surface. In all cases the hairs in the area mentioned between the thighs are white to their bases. There is a small white patch of hairs visible from above on each side of the tail. Below the tail a large triangular naked patch, the apex pointing downwards, larger in the females than in the males. In the type this patch measures from root of tail to apex of triangle 18 mm., and about 14 mm. across at its broadest part. Tail clothed with brown hairs above and white hairs below. Of the specimens examined, nine have the tail shorter than the head and body, three have it longer, and in one specimen the lengths are equal. The difference, in any case, is never great—little more than 10 mm. Feet in the type white, with a suspicion of buff. This buffy tint is stronger in certain specimens.

Skull and teeth as in *rufescens*.

Measurements of the type (taken in the flesh):—

Head and body 140 mm.; tail 130; hind foot 32; ear 23.

Average of twelve adult specimens (all from the type-locality):—

Head and body 130 mm.; tail 130; hind foot 33; ear 23.

Skull: greatest length 35·8 mm.; condylo-incisive length 33·5; basal length 31·2; nasals, length 13·5; interorbital breadth 6·4; zygomatic breadth 20·7; length of upper tooth-row 18·2, of lower (to tip of incisor) 16·5.

Type-locality. Dodoma, Tanganyika Colony, 36° 10′ E., 5′ S.

Type. Adult female. B.M. no. 20. 9. 5. 10. Collector's number 649. Collected by Mr. A. Loveridge on 7th December, 1918, and presented to the British Museum by Lord Swaythling.

Heller [*] treats all the forms in the *rufescens* group with the large chest-gland as subspecies of *rufescens*. The external characters of *ocularis*—notably the large and conspicuous white markings about the eye—and the large bare patch in the sacral region fully entitle it, in my view, to rank as a species.

Taterona swaythlingi, sp. n.

A long-tailed species, with small dark tail-tuft and small bullæ.

The colour of the dorsal region is fawn, finely grizzled with black almost exactly as in *T. lobengulæ*. There is more black on the face and round the eyes, however, and the tail is of the *vicina* type, *i. e.*, black or very dark brown on the upper surface through its entire length, with a small tuft at the extremity. Under surface fawn-coloured, generally without trace of white hairs, though these are present in one or two specimens examined. Under surface and feet white.

Measurements of the type (taken in the flesh):—

Head and body 130 mm.; tail 166; hind foot 35; ear 21.

The average measurements of fifteen specimens are:—

Head and body 134 mm.; tail 164; hind foot 35; ear 21.

Skull: greatest length 40·5 mm.; condylo-incisive 35·2; condylo-basal 36·4; basal 34·5; basilar 31; condylo-basilar 32·4; palatal 21·5; palatilar 17·1; anterior palatal foramina 8·0; posterior 1·6; space between anterior and posterior palatal foramina 3·6; zygomatic breadth 20·7; breadth of brain-case 17·0; interorbital breadth 7·2; nasals 17·2; bullæ 10·0; upper molar series 6.

The dorsal aspect of the skull is flattened. Grooves of incisors well marked.

Type. Adult female. B.M. no. 21. 9. 5. 31. Original number 394. Collected by Mr. A. Loveridge on 25th November, 1918, and presented to the British Museum by Lord Swaythling.

Type-locality. Morogoro, 150 miles west of Dar-es-Salaam.

T. swaythlingi has points in common with both *T. vicina* from the Kenya Colony and *T. lobengulæ* from Matabeleland. It agrees with the former in the character of the tail, in the dark face-markings, and in the length of the posterior palatal foramina, but differs in lacking the reddish body tint with black washing of *vicina*, and in possessing small bullæ. With *T. lobengulæ* it agrees in body-colouring, but differs in tail and face-markings and in the length of the posterior palatal foramina, which in *lobengulæ*, as in all the southern forms, are very short.

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[*] Smithsonian Misc. Coll. vol. lx. no. 12, p. 11 (Nov. 4, 1912).

Taterona taboræ, sp. n.

A grey *Taterona*, with less ochraceous colour than in any species hitherto described. Tail equal in length to head and body, and untufted. Bullæ large.

General colour of back mouse-grey, tinged with buff. Sides clay-colour. Colour of head no darker than back. Hairs of under surface with slaty bases as in *liodon*, except in the sacral region, where they are white throughout. This slaty colour is strongly marked, and gives a dirty greyish-white appearance to the under surface, very different from the pure shining white of most species of *Taterona*. Hands and feet white. Tail greyish brown above, white below, untufted, and with no black hairs. The average length of the tail in six specimens examined is exactly equal to the length of the head and body.

Measurements of the type (taken in the flesh):—

Head and body 140 mm.; tail 130; hind foot 32; ear 21.

Skull: greatest length 39 mm.; condylo-incisive 36·5; basilar 31·5; condylo-basilar 34; palatilar 18·2; anterior palatal foramina 7·2; posterior 1·0; space between anterior and posterior palatal foramina 5·0; interorbital breadth 7·0; bullæ 12·0; upper molar series 7·0.

Dorsal aspect of skull convex, not flattened. Groove of incisors well marked.

Type. Adult male. B.M. no. 21. 9. 5. 14. Original number 585. Collected by Mr. A. Loveridge on 10th December, 1918, and presented to the British Museum by Lord Swaythling.

Type-locality. Tabora, 5° S., 32° 40′ E., in the Tanganyika Colony.

The predominance of grey colouring both above and below in itself separates *T. taboræ* from all other species of the genus. *T. liodon*, which shares with *T. taboræ* the distinction—rare in this genus—of having slaty bases to the hairs of the under surface, is at once distinguished by the slight almost imperceptible grooving of the incisors.

Taterona cosensi, sp. n.

A species with long untufted tail and short posterior palatal foramina.

Colour above ochraceous buff modified by black. Belly-hairs white to the base. Feet white. Tail short-haired, brown above, white below, with none of the long black hairs of more northern forms.

Type. Adult female. B.M. no. 20. 6. 10. 44. Collector's number 1071. Collected by Mr. H. H. Swinny on 10th July, 1919, and presented to the British Museum by Col. G. P. Cosens.

Type-locality. Vihingo, near Ruvu Station, on the railway some 40 miles inland from Dar-es-Salaam. There are to hand eight specimens from the type-locality and six from Kisserawe Mission between Ruvu and Dar-es-Salaam.

Measurements of the type (taken in the flesh):—

Head and body 158 mm.; tail 179; hind foot 35; ear 21.

Average measurements of thirteen specimens:—

Head and body 158 mm.; tail 173; hind foot 34·4; ear 20·7.

Skull: greatest length 43·4 mm.; condylo-incisive 39·2; condylo-basal 39·7; basal 37·1; basilar 33·5; condylo-basilar 35·8; palatal 23·7; palatilar 20·3; anterior palatal foramina 8·5; posterior 1·5; space between anterior and posterior palatal foramina 5·0; zygomatic breadth 22·7; interorbital breadth 7·2; breadth of brain-case 17·5; nasals on median line 16·9; bullæ 12·0; length of upper molar series 7·0. The average condylo-incisive length of the skulls of eleven adult specimens is 38·3 mm.

Dorsal aspect of skull flattened. Groove of incisors well marked.

T. cosensi is externally in colour and appearance very like *T. inclusa* from the Gorongoza District of Portuguese East Africa, but is distinguished from that species by the much smaller hind foot and the large swollen bullæ.

Since the late Mr. R. C. Wroughton wrote his monograph on the genus *Tatera* * a large number of skins and skulls of the African genus *Taterona* have been added to the British Museum collection. In the preparation of the present paper I have gone through all this material, and take this opportunity of putting on record some conclusions I have reached:—

---

* Ann. & Mag. Nat. Hist. (7) xvii. p. 474 (May 1906).

(1) *Taterona* can be divided into forms with tufted and forms with untufted tails. The former are either heavily tufted, as in the Asiatic genus *Tatera*, e. g., *Taterona nigricauda*, or slightly tufted, e. g., *T. vicina*.

(2) The tufted forms are all, with one exception (*T. guineæ*, from Gunnal, in Portuguese Guinea), confined to North-east Africa. These are all to the north of a line drawn from Mombasa to Morogoro, and thence to Muansa on the south shore of Lake Victoria Nyanza, and of a line drawn from the north-east corner of that lake to Mt. Elgon, and thence to the Nile at the northern extremity of Lake Albert. The untufted forms are found all over Africa except the north-west, and share North-east Africa with the tufted forms.

(3) In the untufted forms the posterior palatal foramina are short and in the tufted long. This is what we should expect to find, since, in the heavily tufted *Tatera* of Asia, the posterior palatal foramina are very long. In *Tatera persica* they are almost as long relatively as in *Taterillus*. Where the posterior foramina are long, the space between the anterior and posterior foramina is short, and *vice versâ*. In the untufted forms, of which there are thirty-one type-specimens in the British Museum, this space measures anything from 3 to 5 mm., except in *nigrita* from Uganda, where it measures 2 6 mm. In the tufted forms, of which the Museum possesses six type-skulls, it measures 2·5 to 3 mm., except in the remote *guineæ* (3·5 mm.) and in *swaythlingi*, the southernmost form (3·6 mm.).

I have treated as "tufted" in this paper *T. robusta*, *macropus*, *nigricauda*, *vicina*, *mombasæ*, *phillipsi*, *umbrosa*, *shoana*, *potheri*, *guineæ*, and *swaythlingi*, and as "untufted" all the other forms, ignoring the subgenus *Gerbilliscus*.

Vide also on this subject Hinton and Kershaw, Ann. & Mag. Nat. Hist. (9) vi. p. 98 (July 1920).

Rattus pernanus, sp. n.

Among a collection of skins sent by the Nairobi Museum in the Kenya Colony to the British Museum recently for identification, there are two of a *Rattus*, which requires description as a new form:—

Type. Young adult male. B.M. no. 21. 9. 6. 15. Original number 34. Collected by Mr. R. B. Wobsnam on 3rd November, 1912, and presented to the British Museum by the Nairobi Museum.

Type-locality. Amala River (also called Mara River), which rises at Kabalolot Hill in the Sotik, Kenya Colony, and enters Lake Victoria Nyanza in the Tanganyika Colony at 1° 30′ S., 34° E.

Description.—This is a dwarf form of *Rattus*, in size a trifle smaller than *Mus musculus*. The type measures:—Head and body 76 mm.; tail 65; hind foot 15; ear 14. The measurements of the other specimen are about the same. The hair is soft and long, about 10 mm. in length on the back. Colour very similar to that of *Rattus coucha panya*. The sides and flanks are a rich brown, between "mummy" and "Prout's" (Ridgway); the back darker, owing to the hairs being tipped with black or dark brown; hairs of the under surface slate-grey with white tips, resulting in a general pearl-grey colour. There is a fairly well-defined tawny-ochraceous stripe dividing the colours of the upper and under surfaces. Tail shorter than head and body, thickly clothed with short appressed hairs, longer on the terminal third, and forming a perceptible pencil at the tip. Colour of tail brown on the proximal two-thirds, and black clothed with whitish hairs on the distal portion; lighter below. Feet and hands white. Large white spot behind the ear.

Skull: total length 23·3 mm.; condylo-incisive length 21·3; greatest breadth (at posterior of zygomata) 12·0; breadth of brain-case 10·3; length of nasals on median line 8·8; inter-orbital constriction 4.

The palatal foramina extend back to about the middle of the anterior central cusp of m^1; m^1 equal in length (1·8 mm.) to m^2 and m^3 combined. The incisors and molars are typical of *Rattus* (as distinct from *Mus*), there being no distortion of the first lamina of m^1 nor any subapical notch in the upper incisor.

The two specimens received of this interesting diminutive rat are both males, so that it is not possible at present to give the mammary formula. The indications are that it will prove to belong to the subgenus *Mastomys*, since it has little in common with the other African subgenera of *Rattus*. In general appearance it is like a dwarf *R.* (*Mastomys*) *coucha*, and the proportion of tail to body—about 85 per cent.—is characteristic of the multimammate rats. Practically all the small mouse-like African rats belong to the subgenus *Praomys*, all the known species of which have very long tails.

The teeth of the type are not much worn, and show that the specimen, though adult, is young. Thus, the measurements given may prove to be on the small side.

LV.—*A new Hedgehog from the Island of Djerba, Tunis.*

By Oldfield Thomas.

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By the kind intermediation of Dr. Hartert, the British Museum has received, as a donation, from Mons. Blanc, the well-known naturalist of Tunis, a number of small mammals from that still little-known country.

Among these there are examples of the following new form of hedgehog:—

Paraechinus deserti blancalis, subsp. n.

Essential characters as in true *deserti*, but with a greater amount of white. Under surface almost wholly white, a small area in the inguinal region alone brown; in *deserti* the lower surface is prominently brown as far forward as the sternum. Ears whitish behind, with scarcely any brown on them. Limbs also with less white, the terminal brown only commencing on the wrists and ankles, while in *deserti* the forearms and legs are also brown.

Skull as in *deserti*.

Condylo-basal length of skull 46 mm.; zygomatic breadth 28; upper tooth-series 21·7.

Hab. Island of Djerba, S.E. Tunis.

Type. Adult female. B.M. no. 20.5.4.5. Original number 8 *b*. Presented by Mons. Blanc of Tunis. Five specimens examined.

No doubt very closely allied to the *deserti* of the mainland, but distinguishable by its less brown underside.

LVI.—*On some Remains of a Theropodous Dinosaur from the Lower Lias of Barrow-on-Soar.* By Charles W. Andrews, D.Sc., F.R.S. (British Museum Natural History).

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Remains of Theropodous Dinosaurs in deposits of Liassic age are of extreme rarity. Lydekker has described and figured (Catal. Foss. Rept. Brit. Mus. pt. i. (1888) p. 173, fig. 28) a tooth from the Lower Lias of Lyme Regis, which he doubtfully refers to the Triassic genus *Zanclodon*. Later, Dr. Smith Woodward gave an account with a figure (Ann. & Mag. Nat. Hist. ser. 8, vol. i. (1908) p. 257) of a small slender right tibia from the Lower Lias of Wilmcote, Warwickshire. This he regards as belonging to a lightly-built and active Megalosaurian Dinosaur, pointing out that the great development of the anterior ascending process of the astragalus shows clearly that this Liassic type is more nearly related to the Jurassic members of the group than to those from the Trias. Dr. von Huene (Palæont. Abhandl. Suppl. 1, Lief. 5 (1908), p. 326) agrees with this view, and goes so far as to refer the animal to the genus *Megalosaurus*.

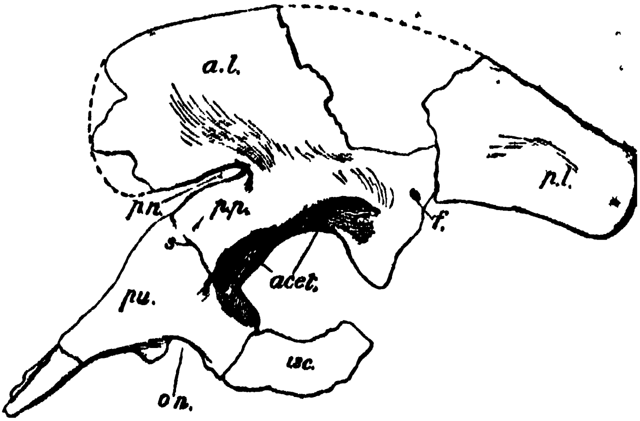
These two specimens seem to be the only Megalosaurian remains known up till now from the Lower Lias—at least, of this country.

Recently Mr. S. L. Wood has obtained from the Lower Lias of Barrow-on-Soar, Leicestershire, portions of the pelvis, an imperfect left femur, and part of a vertebral centrum of a small Theropodous Dinosaur: these specimens form the subject of the present note.

The pelvis is represented by (1) the anterior portion of the left ilium, with which is united the proximal end of the pubis; (2) the acetabular region of the right ilium, with which are united portions of the proximal ends of the pubis and ischium; (3) the posterior end of the right ilium, the precise position of which in relation to the anterior portion can only be approximately determined. The femur belongs to the left side and is imperfect at both ends. The vertebra is represented only by about half the centrum and part of the neural arch; it probably belongs to the dorsal region.

The *ilium* (fig. 1), so far as preserved, is very similar to that of *Megalosaurus bucklandi*. Its anterior portion (*a.l.*) forms a broadly rounded lobe, the outer surface of which is gently concave externally; the bone in this region is very thin, with a slightly thickened upper border, the surface of which is somewhat roughened for the attachment of muscle. The anterior lobe is separated from the relatively massive pubic process (*p.p.*) by a much narrower preacetabular notch (*p.n.*) than in *Megalosaurus*, and more nearly similar to what is seen in *Ceratosaurus*, in which, however, the pubic process is less massive. The narrowness of this notch seems to be due partly to the relatively large size of the pubic process and partly to its being directed more forwards and less downwards than in the other forms referred to. The pubic process is triangular in section, the ventral (acetabular) surface (*acet.*) being deeply concave from side to side. This concavity is continuous with the rest of the acetabular surface of the ilium, the outer edge of which forms a prominent and sharp-edged lip, which increases in width towards the point of union with the ischium. The anterior end of the pubic process unites with the pubis in a slightly convex surface. Behind the acetabulum the ilium unites with the ischium, but the details of the suture are not clear. The posterior fragment of the right ilium (*p.l.*) narrows gradually towards its posterior end, which is gently convex, being somewhat thickened and roughened for the attachment of a muscle, probably the ilio-caudal. The outer surface is concave from above downwards, while on the inner face there is a thickened and downwardly-reflected flange running down from the postero-superior angle to the base of the ischial process. The inner face of this flange is roughened, and no doubt united with the posterior part of the sacrum.

Fig. 1.



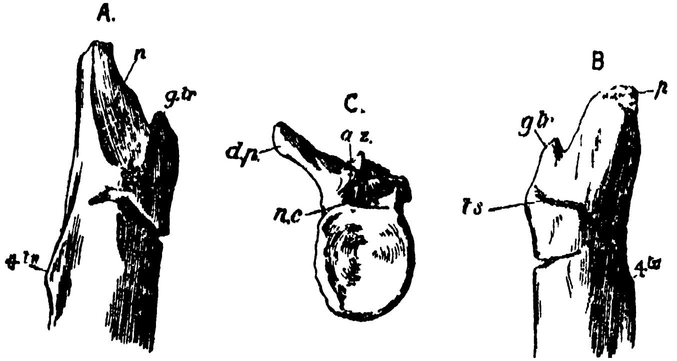
Pelvis of *Sarcosaurus woodi* from the left side, partly restored from the right side. ⅕ nat. size. *acet.*, acetabulum; *a.l.*, anterior lobe of ilium; *f.*, foramen in (?) ilium; *isc.*, ischium; *o.n.*, obturator notch; *p.l.*, posterior lobe of ilium; *p.n.*, preacetabular notch; *p.p.*, pubic process of ilium; *pu.*, pubis; *s.*, suture between ilium and pubis.

The Pubis (fig. 1).—The proximal ends of both pubes are preserved, that of the right side being the more complete. This bone, which seems to have been larger in proportion to the ilium than in later forms, unites to the pubic process of the ilium in a slightly concave suture; below this it bears on its posterior face a triangular surface, which forms the anterior wall of the acetabulum (*acet.*); beneath this again there is a short process, separated from the acetabulum by a distinct notch and curving backwards to unite with the pubic process of the ischium in a flat suture, triangular in outline, the lower border being thin and sharp. Anteriorly the ischial process of the pubis is limited by a large and well-defined obturator notch (*o.n*), which, when the bone was unbroken, may have been a closed foramen, though this does not seem likely. Distal to this notch, and separated from it by the prominence forming its anterior border, the shaft of the pubis narrows very rapidly and becomes compressed from above downwards; this region is strengthened by a ridge on its inner side continuous with the anterior border of the obturator notch. The distal portion of the bone is wanting on both sides.

The Ischium (fig. 1, *isc.*).—This bone is represented on the right side by some fragments of its proximal end. A portion of the pubic process is present: this forms the lower border of the acetabulum. It thickens towards the junction with the pubis; its ventral edge is thin and sharp throughout. The relation of the ischium to the ilium is obscure; there does not seem to have been a definite ischial process on the ilium. Immediately behind the acetabulum there is a deep rugose pit, from which a foramen (*f.*) penetrates to the inner face of the bone. It is doubtful whether this pit is borne by the ilium or the ischium, but it seems to correspond in position with the rugosity on the ischium of *Ornitholestes* figured by Gregory and Camp (Bull. Amer. Mus. Nat. Hist. vol. xxxviii. (1918) pl. xlvi.), and regarded by them as serving for the origin of the flexor tibialis internus (semimembranosus) muscle.

The Femur (fig. 2, A, B).—The femur of the left side was found associated with the pelvis, but, unfortunately, it is badly preserved. The head is broken away, as also is the end of the fourth trochanter. The distal end is much crushed, and the condyles are wanting. The bone, as a whole, is rather strongly curved, the convexity being in front. The middle part of the shaft is nearly cylindrical, but tends to widen out towards the ends, particularly distally. The summit of the bone, just external to the fractured surface which marks the loss of the head, bears a shallow pit (*p.*), beneath which on the outer side of the bone there is a narrow flat surface running down to the trochanteric shelf (*t.s.*), described below. The anterior face of the upper end is also nearly a flat surface, terminating below in the notch formed by the peg-like anterior (great) trochanter (*g tr.*). From the base of this projection a shelf-like surface (*t.s.*) runs back to the posterior border of the bone. From the base of the trochanter a strong roughened ridge runs down the shaft towards its inner border, probably reaching the upper angle of the inner condyle, but the distal portion is incomplete. The fourth trochanter (4 *tr.*) forms a very prominent ridge on the upper part of the posterior face of the shaft; on its inner side there is a large, slightly concave roughened area for the attachment of muscle. The lower end of this trochanteric ridge is at about the middle of the shaft. As already mentioned, the distal condyles are wanting, but it can be seen that, even allowing for expansion due to crushing, the distal articulation must have been a fairly wide one. The walls of the bone are relatively very thin, the central cavity being large; thus in the middle of the shaft, where its diameter is about 35 mm., the thickness of the bony wall is only between 4 and 5 mm. Towards the proximal end of the bone a fracture shows that the central cavity was divided up by irregular septa of bone.

Fig. 2.



A. Upper end of femur of *Sarcosaurus woodi*, from inner side; B, Ditto from outer side; C, Anterior face of imperfect dorsal vertebra. ⅓ nat. size. *a.z.*, anterior zygapophysis; *d.p.*, diapophysis; *g.tr.*, great (anterior) trochanter; *n.*, broken surface of neck of femur; *n.c.*, neural canal; *p.*, pit at upper end of femur; *t.s.*, trochanteric shelf; 4 *tr.*, fourth trochanter (imperfect).

The anterior half of a vertebra (fig. 2, C), apparently from the posterior dorsal region, is preserved. The neural arch, with part of one of the diapophyses and the anterior zygapophyses are present, but the neural spine is wanting. The anterior face of the centrum is very slightly concave. Its upper border beneath the neural canal (*n.c.*) is nearly straight; its height is about equal to its breadth. The border of the articular face forms a sharp edge, behind which the centrum contracts very rapidly in diameter; beneath the pedicle of the arch the sides of the centrum are excavated by a fairly deep elongated fossa. The anterior zygapophyses (*a.z.*) are small, and project very little in front of the anterior face of the centrum, their articular faces look directly upwards. The diapophysis (*d.p.*), which is only partly preserved on one side, projects upwards, making an angle of about 45 degrees with the vertical plane. The postero-ventral face of the diapophysis seems to have been concave. There may have been a small parapophysial facet.

The enlargement of the anterior lobe of the ilium sharply differentiates this Dinosaur from the Triassic Theropods. This expansion seems to be the consequence of the necessity for a larger surface for the attachment of the ilio-femoralis externus muscle, the enlargement of which, as von Huene has pointed out, is probably due to the adoption of an upright bipedal mode of progression. This muscle is inserted distally upon the great trochanter of the femur, but, although this is better developed than in the Triassic forms, it does not form the prominent flange of bone usual in most of the later types *, but remains small and peg-like; in this respect the present species occupies an intermediate position between the Triassic and later Jurassic forms, such as might have been expected from the horizon at which it occurs. The development of the anterior process of the astragalus deduced by Dr. Smith Woodward from the structure of the tibia, described by him and referred to above, is no doubt correlated with the change in the mode of progression.

The relatively large size of the pubes and probably of the ischia seems to be a primitive character.

The Dinosaurian remains above described certainly belong to a member of the Megalosauridæ, but at the same time differ so considerably from the corresponding bones of *Megalosaurus* itself that it seems necessary to refer the species to a new genus, for which the name *Sarcosaurus* is suggested, the specific name being *Sarcosaurus woodi*, in honour of the discoverer, Mr. S. L. Wood. Probably the tibia described by Dr. Smith Woodward is referable to the same species.

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* In *Ceratosaurus* the trochanter appears to have been considerably smaller than in *Anthrodemus* (*Allosaurus*) or *Megalosaurus*, but, nevertheless, is larger than in the present species.

The dimensions (in centimetres) of the specimens are:

Height of anterior lobe of ilium	7·0
Height of the proximal end of the pubis	6·0
Width of the proximal end of the pubis (from within outwards)	2·7
Greatest width of the acetabular cavity (from within outwards)	3·7
Length of the femur, so far as preserved	31·5
Diameter of the middle of the shaft of the femur	3·6
Width of the anterior face of vertebral centrum	4·0
Height of the anterior face of vertebral centrum	4·0

LVII.—*On the Life-history of* Dasyhelea obscura, *Winnertz (Diptera, Nematocera,* Ceratopogonidæ*), with some Remarks on the Parasites and Hereditary Bacterian Symbiont of this Midge.*

By D. Keilin, Sc.D., Beit Memorial Research Fellow (Quick Laboratory, University of Cambridge).

[Plates XIX. & XX.]

Contents.

Page
I. Habitat of the Larva of *Dasyhelea obscura* 576
II. Eggs and Oviposition 577
III. Larva 578
(*a*) Head; (*b*) Thorax; (*c*) Abdomen; (*d*) Internal Organs.
IV. Pupa 582
V. Larvæ of other Species of *Dasyhelea*, recorded by various Authors 583
VI. Predaceous Dipterous Larvæ living upon the Larvæ and Pupæ of *Dasyhelea obscura* 587
VII. Parasites of *Dasyhelea* Larvæ 587
VIII. Hereditary Bacterian Symbiont of *Dasyhelea obscura* 588
IX. References 588
X. Explanation of the Plates 589

I. HABITAT OF THE LARVA OF *DASYHELEA OBSCURA*.

Dasyhelea obscura, Winnertz, is a very common midge, the early stages of which are almost always found in the decomposed sap filling the wounds of elm trees. The material which was used for the present study was obtained from a wound of an elm tree standing on the Caius College ground at Newnham (Cambridge) and facing Church Rate Walk. In addition to *Dasyhelea* larvæ, the decomposed sap of this wound contained the larvæ and pupæ of several other Diptera: (1) *Rhyphus fenestralis*, Scop., (2) *Mycetobia* *pallipes*, Meig., (3) *Systenus adpropinquans*, Loew., (4) *S. scholtzii*, Loew., (5) *Aulacogaster rufitarsis*, Meig., (6) *Phaonia cincta*, Zett., and (7) an undetermined Syrphid larvæ closely allied to the genus *Ceria*. This wound was also visited by the predaceous larvæ of two Staphylinidæ *—one belonging probably to the genus *Quedius* sp. (subfamily Staphylininæ), the other being possibly a *Thamiaræa* sp. (subfamily Aleocharinæ).

Finally, the whole surface of the decomposed sap of this wound, and especially its solidified portions, was covered by myriads of a mite, *Hericia hericia*, Kramer (Tyroglyphidæ), in all the stages of its development.

The larvæ of *Dasyhelea* were also common in a similar wound of a horse-chestnut tree standing on the ground between the School of Agriculture and the Downing College grounds, and Mr. W. F. Edwards has kindly communicated to me the following unpublished records concerning the various breeding-places of this midge:—

(1) J. E. Collin bred it with *Culicoides varius*, Winnertz, and *Culicoides fascipennis* from débris of a chestnut tree (Snailwell, Cambs).

(2) F. Jenkinson reared them from elm sap (Logie, Elgin and Cambridge).

(3) F. W. Edwards himself obtained *D. obscura*: (*a*) with *Rhyphus fenestralis* from the decaying roots of *Angelica* (Knebworth, Herts), (*b*) from running sap of an oak, (*c*) with *Mycetobia pallipes*, *Systenus* sp., and an undetermined Syrphid from running sap of hornbeam, and, finally, (*d*) with *Rhyphus fenestralis* and *Mycetobia* from stagnant water in a hole in an oak tree (Epping Forest).

To find the early stages of *Dasyhelea obscura* it is sufficient to collect a small quantity of semifluid exudate filling the wound of an elm tree, to stir it in a petrie-dish with a little tap water, and leave it for an hour or more to settle. Examined under the binocular microscope, the eggs, larvæ, and pupæ of *Dasyhelea* are very easily detected on the bottom of the dish.

II. EGGS AND OVIPOSITION. (Pl. XIX. fig. 4, and text-fig. 1.)

The female seems to oviposit only once in her life, and the eggs, about 120 in number, are laid simultaneously upon the solid particles sticking out from the exudate or upon the moistened edges of the wound.

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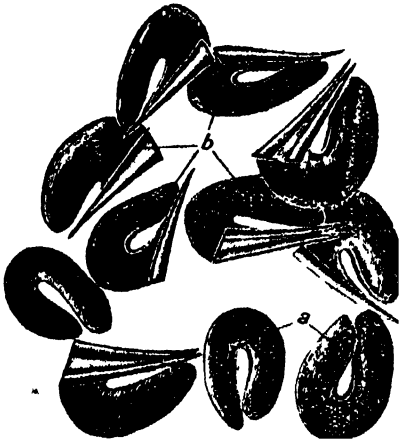
* The identification of these larvæ I owe to the kindness of Mr. K. G. Blair of the British Museum.

Each egg is surrounded by a gelatinous layer, and they are all embedded in a common gelatinous mass, somewhat similar to that of various Chironomids or Rhyphids (*Rhyphus* and *Mycetobia*). The egg is of a very dark brown colour and of a peculiar shape, which to my knowledge has not yet been encountered in any other insect. It is of elongate oval shape, 500 μ long and 75 μ in diameter, and sharply bent in its middle so that its two branches come almost into contact. The embryo and the young larva have the same curvature as the egg. When the larva hatches, the egg is split at one end, corresponding to the anterior and dorsal side of the enclosed larva, and the two edges of the split roll up externally, leaving a triangular opening through which the larva escapes.

Text-fig. 1.



A small portion of an egg-mass of *Dasyhelea obscura*, showing the eggs (*a*) before and (*b*) after the hatching of the larvæ; the gelatinous mass covering the eggs is not represented in the figure.

III. Larva.

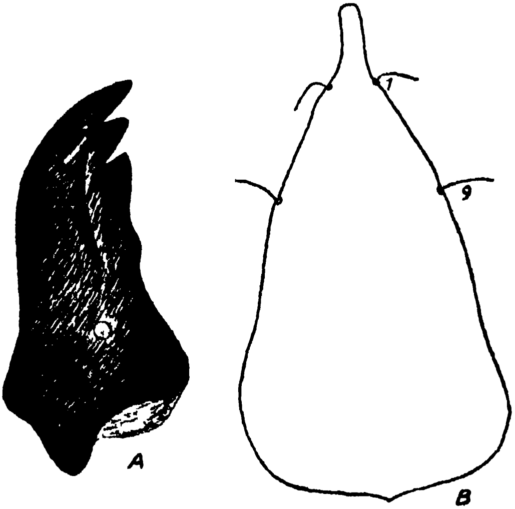
The larva when it hatches from the egg is 0·7 mm. long; it grows, undergoing several moults, and when ready to pupate it reaches 4 to 5 mm. in length and 0·2 to 0·3 mm. in diameter. The movements of the larva are very slow; it does not swim, and, when immersed in water, it crawls very slowly on the bottom of the dish, bending and unbending its body. The latter is composed of a head, 3 thoracic and 8 abdominal segments, the last abdominal segment being double (Pl. XIX. fig. 8).

(a) *The Head.*

The head of the larva is of a dark brown colour, triangular in shape, 330 μ long and 175 μ wide in its basal portion (Pl. XIX. fig. 1). Examined from the dorsal side, it shows clearly the suture which marks the dorsal plate or clypeus, which, in the skin cast at the moults, is very easily separated from the rest of the head, and then shows two pairs of short sensory hairs emerging from the edges of its anterior portion (text-fig. 2, B, *1* and *9*). The head bears a definite number (11 pairs) of sensory hairs and pits, the distribution of which is shown in fig. 1 (Pl. XIX.).

The *eyes* are heavily pigmented and crescent-shaped.

Text-fig. 2.



A, mandibule of the larva of *D. obscura*; B, its clypeus.

The *antennæ* (*a* and Pl. XIX. fig. 5) are very small and situated near the anterior end of the head; they are composed of a basilar segment bearing a special sensory organ corresponding to the bell-shaped papillæ of the antennæ of many other Dipterous larvæ. The basal segment shows, moreover, a short protuberance provided with four cylindrical papillæ.

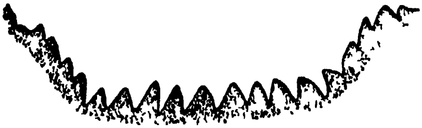
The *labrum*, which follows the clypeal plate, is very short. Its dorsal side (Pl. XX. fig. 10) shows a pair of sensory hairs and a pair of sensory circular pits. The ventral side is of a more complicated structure (Pl. XIX. fig. 2); it is provided with 4 pairs of sensory circular papillæ, followed by 3 pairs of ordinary sensory hairs, one pair of pectinate hairs, one pair of short conical papillæ, one single median transparent papilla, and, finally, a median soft protuberance covered with short chitinous hairs. Viewed by transparency the labrum shows also a strongly chitinized structure, which serves for the attachment of the labral muscles.

The *maxillæ* (Pl. XIX. fig. 3) are very flattened and reduced almost to a group of sensory organs, comprising (*a*) a circular papilla, (*b*) a sensory hair, (*c*) a pit with 3 to 4 cylindrical papillæ, followed by (*d*) an ordinary circular papillæ and (*e*) a protrusible vesicle bearing 3 to 4 small papillæ.

The *mandibles* (text-fig. 2, A, and Pl. XIX. fig. 1, *m.*) are very strongly chitinized and provided with 4 teeth, 3 of which are clearly visible from the side.

The *labium* (text-fig. 3) has the form of a chitinous plate ending in 17 to 19 teeth.

Text-fig. 3.



Dasyhelea obscura: labium of the larva, seen ventrally.

The *hypopharynx* is very well seen by transmitted light as a very dark transverse chitinous sclerite occupying the central portion of the head capsule (Pl. XIX. fig. 1, *h.*). Its structure is much more complicated than was described by Goetghebuer (1914, p. 182, pl. ii. fig. 2) in a closely-allied species of *Dasyhelea*. It does not form one solid chitinous plate as represented by this author, but is composed of the following four independent sclerites (Pl. XIX. figs. 6 & 7):—

(1) A ventral triangular plate (*v.*) with its lateral edges strongly chitinized and showing two ventral projections: one near the base of the triangle and another near the anterior angle of it, against the opening of the common duct (*s.*) of the salivary glands. The basal portion of the ventral sclerite forms a striated ridge (*r.*) from which originate numerous brown setæ directed backwards. The surface of this sclerite when examined ventrally shows four successive zones: (*a*) clear zone which receives the salivary duct, (*b*) an uniformly pigmented zone, (*c*) finely granulated zone, and (*d*) a more roughly granulated zone.

(2) The dorsal sclerite (*d.*) is very strongly chitinized and of almost quadrangular shape; it also bears posteriorly a

series of long setæ of brown colour, which in places are superposed with the setæ of the ventral sclerite.

(3, 4) Two lateral wing-like sclerites (*l.*) are articulated with the dorsal sclerite and serve for attachment of well-developed muscles. They are not evenly chitinized, and show clear and dark patches of chitin. The whole structure is connected with labium by means of two forked chitinous rods (*rd.*), which lie in the lateral walls of the buccal cavity. It is difficult to say, at present, if all the above-described sclerites form the hypopharynx, or if the latter is formed only by the ventral plate. This can only be settled by a comparative study of this structure in several other species of *Dasyhelea* and the closely-allied genera like *Culicoides* and *Forcipomyia.*

(b) *The Thorax.*

The thorax is composed of 3 segments of brownish colour; the latter is due to the brown granules filling the peripheral fat body-cells which line the hypodermis; clear unpigmented spaces remain only in the areas occupied by the imaginal discs of wings, halteres, and legs. The segments are furnished with a series of sensory hairs and pits, among which special attention must be given to the 6 groups of ventral sensory organs representing the remains of the thoracic legs of Dipterous larvæ. Each sensory group (Pl. XX. fig. 16) is composed of two long hairs and 2 pits connected with the imaginal discs of thoracic legs.

(c) *The Abdomen.*

The 7 first abdominal segments show a brownish coloration, due to the underlying fat body-cells, which, being more or less regularly distributed, produce a pigmented pattern characteristic of this larva (Pl. XX. fig. 9). These segments bear also a few sensory hairs and pits. The last abdominal segment is double; its anterior portion differs very little from the previous 7 abdominal segments, while its posterior portion has a very characteristic structure, which will be described below. It bears posteriorly the anus and a series of strong chitinous hooks bent anteriorly. Eight of these hooks, disposed in 2 groups of 4, are ventral (Pl. XX. fig. 13), while 2 pairs of similar hooks are dorsal in position (Pl. XX. fig. 12). Two small conical soft papillæ are seen among the hooks on the ventral sides. Laterally and close to its anterior boundary this segment shows two transverse elliptical transparent prominences (Pl. XX. fig. 11, *p.*). The space between the large hooks show a few rows of small dark hooklets or spines bent anteriorly. By pressing a living larva between the slide and a cover-glass, four bifid transparent papillæ make their appearance from the anal opening. When completely everted from the larval body these papillæ are seen to arise in pairs from two large transparent vesicular bodies (Pl. XX. fig. 14). These protrusible papillæ (*rg.*) are homologous with the rectal gills of other Chironomid larvæ. In most cases when the larvæ are under observation, the rectal gills and the 6 pairs of hooks are retracted inside the body of the larva.

(d) *Internal Organs.*

Alimentary Canal.—The pharynx is followed by the œsophagus, which in the 3rd thoracic segment enters the proventriculus. The mid-gut is a straight cylindrical tube. The two pairs of Malpighian tubes arise at the junction of mid- and hind-gut, the anterior pair being long while the posterior pair is short. There is no intestinal cœca. The salivary glands are well developed and extend from the 2nd thoracic to the 6th abdominal segment. The cells of these glands sometimes show in their protoplasm needle-shaped crystals, the nature of which I was unable to determine.

The *nerve system* is composed of cerebral ganglia and 10 pairs of ganglia of the ventral chain, the last being double and composed of two pairs (10th and 11th) fused together.

The *respiratory system* is apneustic, with the tracheæ and especially the peripheral thoracic and the rectal well developed. The remains of the 10 pairs of non-functional spiracles are connected with the main tracheal trunks by means of 10 pairs of filaments without any lumen. The vestiges of spiracles are found in the pro- and metathoracic and in the 8 abdominal segments.

The *fat-body*, in addition to the peripheral sub-hypodermic pigmented cells, comprises two longitudinal perivisceral bodies devoid of brownish excretory granules.

IV. PUPA.

The pupa is completely free from the larval cuticle. It is 2·3 mm. long and of a brown colour. It becomes dark, almost black, when the imago is almost completely formed, but this coloration is due to the early pigmentation of the hairs of the imago seen through the transparent cuticle of the pupa.

The main characters of the pupa, which are of taxonomic value, are shown in figs. 15 to 21 (Pl. XX.). Each wing of the pupa bears near its terminal portion a small knob-like protuberance (*p.w.*, fig. 15, Pl. XX.). Two pairs of legs are superposing one above the other, while the third pair (*l.* 3) is curved and lies beneath the wings.

The respiratory tubes or horns (Pl. XX. fig. 15, *p.h.*, and fig. 21) show numerous scale-like triangular plates and bear from 21 to 22 respiratory papillæ. The abdominal segments are divided, each by a row of dark strongly chitinized hooks and plates, into two portions, anterior and posterior (Pl. XX. fig. 19). The hooks grow in size near the lateral sides of the segments, and become flattened and almost scale-like near the dorsal and ventral median lines. Each hook or scale bears a sensory hair arising from a small circular pit (Pl. XX. figs. 17 & 18). In front of the row of hooks the dorsal side of each abdominal segment shows 2 more or less chitinized spots and, more laterally, 2 short sensory papillæ.

The whole surface of the abdominal segments is covered with short hooklets or scale-like projections.

The last abdominal segment shows ventrally a longitudinal split and dorsally four pairs of strongly chitinized papillæ, two of which are provided with sensory hairs (Pl. XX. fig. 20).

The pupal stage is of a very short duration—six or seven days only.

V. LARVÆ OF OTHER SPECIES OF *DASYHELEA*, RECORDED BY VARIOUS AUTHORS.

The genus *Dasyhelea* is composed of several species, some of which are difficult to identify as there still remains some confusion about their nomenclature.

Mr. F. W. Edwards, of the British Museum, has kindly supplied me with the following list and synonymy of a few species of *Dasyhelea*, the early stages of which have been recorded and in some cases described:—

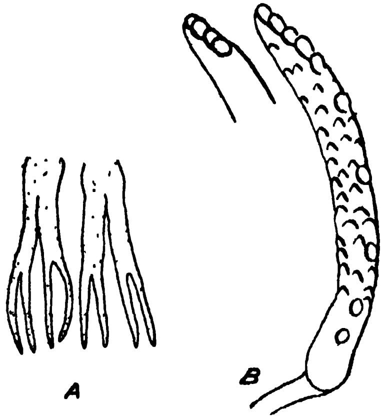
1. *Dasyhelea flavifrons*, Guérin, 1833.
2. *Dasyhelea dufouri*, Laboulbène, 1869.
3. *Dasyhelea hippocastani*, Mik, 1888.
4. *Dasyhelea obscura*, Winnertz, 1852.
   D. homocera, Kieffer, 1919.
5. *Dasyhelea obscura*, var. *goetghebueri*, Kieffer.
   D. versicolor, Goetghebuer, 1914 and 1920.
   D. goetghebueri, Kieffer, 1919.
   D. brevitibialis, Goetghebuer, 1919.
6. *D. versicolor*, Winnertz, 1852.
   D. sensualis, Kieffer, 1919.
   D. bilineata, Goetghebuer, 1920.
7. *Dasyhelea halophila*, Kieffer, 1911.
8. *Dasyhelea courctata*, Kieffer, 1913, 1914.
9. *Dasyhelea diplosis*, Kieffer, 1913, 1914.
10. *Dasyhelea longipalpis*, Kieffer, 1913.

1. *Dasyhelea flavifrons*, Guérin, 1838.

This midge was bred by Guérin from pupæ found in the decomposed sap of an elm tree (in Paris). In his paper he gives a figure of the pupa (pl. viii. fig. 2, *e*), which unfortunately does not convey a single character of taxonomic importance.

The same species was also bred by Dr. Sharp from beech-tree sap in the New Forest, and by F. W. Edwards from horse-chestnut tree sap at Sidmouth. Through the kindness of Mr. F. W. Edwards, I was able to examine a few larvæ and pupæ of this species, and to compare them with those of *D. obscura*, Winnertz. The character of the larva of *D. flavifrons* which enables one to differentiate it most readily from *D. obscura* is in the structure of its rectal gills. As text-fig. 4, A, shows, the 8 terminal branches in *D. flavifrons* are much longer than those in *D. obscura* (*cf.* Pl. XX. fig. 14). The prothoracic horns of the pupa in *D. flavifrons* (text-fig. 4, B) each bear only 13 spiracular papillæ instead of 21–22, as is the case in *D. obscura*.

Text-fig. 4.



Dasyhelea flavifrons: A, rectal gills; B, respiratory prothoracic horns.

2. *Dasyhelea dufouri*, Laboulbène, 1869.

The larvæ and pupæ of this species were discovered by Laboulbène (1869) in the thick sap filling the wounds of elm trees in Paris: his descriptions of larva and pupa are, however, very incomplete, and do not contain any characters of use in the identification of this species.

3. *Dasyhelea hippocastani,* Mik, 1888.

This species was reared by Mik (1888) from larvæ and pupæ found in ulcerating wounds of *Æsculus hippocastanum.* Unfortunately the larvæ and pupæ are very insufficiently described and figured.

4. *Dasyhelea obscura,* Winnertz, 1852.

The eggs, larvæ, and pupæ of this species are for the first time described in the present paper.

5. *Dasyhelea obscura,* var. *goetghebueri,* Kieffer.

According to F. W. Edwards, the larvæ and pupæ of this species were described by Goetghebuer (1914) under the name of *Culicoides versicolor,* Winnertz. From Goetghebuer's description and figures it appears that the larvæ and pupæ of this species differ in many respects from those of *D. obscura.*

(*a*) The number of post-abdominal hooks of the larva in Goetghebuer's species is 14, while in *D. obscura* there are only 12.

(*b*) The rectal gills are more elongated and of a type similar to those of *D. flavifrons* (*cf.* text-fig. 13).

(*c*) The prothoracic horns of the pupa show the scales only in their middle portion, and the number of papillæ is reduced to about 12, while in *D. obscura* it is 21 to 22.

These differences show that the species described by Goetghebuer under the name of *C. versicolor* cannot be regarded as a mere variety of *obscura,* but has to be separated as a new species; it would be better to reserve for it the specific name of *D. goetghebueri,* already given to it by Kieffer (1919).

6. *Dasyhelea versicolor,* Winnertz, 1852.

This midge has been reared by Miss Stow from humus surrounding the roots of *Spiræa ulmaria* (Grantham, Lincs), and by F. W. Edwards from the scum on the surface of an aquarium (Hitchin, Herts). The pupæ of this species which I have received from Mr. F. W. Edwards differ very little from those of *D. obscura.* All I can say at present is that the few pupæ of *D. versicolor* which I have examined are more strongly chitinized, that the 3 medio-dorsal spots of the abdominal segments are more prominent, and that the scales and hooks covering the abdominal segments are more developed than is the case in the pupæ of *D. obscura.*

7. *Dasyhelea halophila*, Kieffer, 1911.

This species represents the type of the genus *Dasyhelea*. The larvæ and pupæ of this midge were for the first time found and described by Rhode (1912, pp. 24–26, quoted by Rieth, 1915). According to Rieth (1915) the larvæ and pupæ of *D. halophila* were found by Prof. Steuer-Insbruck in a rock-pool at Manera Bay near Ragoznica (Sabenico), and also in rock-pools at Scoglio Mulo. The larva is 5 to 6 mm. long; the head is of a light brown colour and is about twice as long as broad; the post-abdominal hooks are brown and only slightly curved. The pupa is 4 to 5 mm. long; the prothoracic horns are covered with triangular plates. The forked post-abdominal protrusions are bifurcated (see his text-figs.: 46, 48–50, 52, 53, 62, & 64).

8. *Dasyhelea coarctata*, Kieffer, 1913–1914.

According to Rieth (1915) the larva of this species was found by Dr. Martin Hasper in a river at Monte San Bernardo, near Lugano. The larva is 6 to 7 mm. long and similar to that of *halophila*. The pupa is 5 to 6 mm. long.

9. *Dasyhelea diplosis*, Kieffer, 1913, 1914.

According to Rieth (1915) the larvæ and pupæ of this midge were found by A. Thienmann in Westfalia, in incredibly high numbers between the filamentous Algæ.

The salt content of this water varied from 7·219 g. to 13·485 g. per l., and at the end of May the pupæ of this fly were found in another pool with salt content 61·83 g. per l. The larva and pupa of *D. diplosis* have been described and figured by Rieth (1915, figs. 45, 47, 51, 54, 61, 63, & 65, A). The larva is 6 to 7 mm. long, white and opaque; the post-abdominal hooks are transparent, short, and markedly curved. The head is long, only one and a half times the width. The pupa is 5 to 6 mm. long; the respiratory prothoracic horns are devoid of scales, but are annulated along two-thirds of their posterior portion. The forked protrusions of the last abdominal segment of the pupa are short and simple.

10. *Dasyhelea longipalpis*, Kieffer, 1913.

According to Rieth (1915) the larvæ and pupæ of this species were found by R. Schmidt upon the filamentous Algæ in a pool containing salt water. Similar pupæ were found by N. von Hofsten in Müstermyre, in Gotland Island, and in the pools of Hörstel (with salt content 28·890 per l.).

The pupæ of this species (see Rieth, pp. 424–425 and figs. 60 & 65) are 3 to 4 mm. long; the prothoracic horns are ribbon-like and throughout their length show a spiral structure. The post-abdominal forked protrusions are short and simple.

Finally, it can be added that several species of *Dasyhelea* have been reared by Carter, Ingram, and Macfie (1920) in the Gold Coast, Africa, from the rot-holes in various trees, "such as the flamboyant, the silk cotton, the mango, a species of *Cynometra*, etc. . . . . from partly decomposed roots or bases of banana stumps, and from the rotted wood at the sides and ends of canoes" (p. 202). The larvæ and pupæ observed by these authors still await description, but from the account of their behaviour it follows that they are very similar to those of *Dasyhelea obscura.*

VI. PREDACEOUS DIPTEROUS LARVÆ LIVING UPON THE LARVÆ AND PUPÆ OF *DASYHELEA OBSCURA.*

The larvæ and pupæ of *D. obscura* are destroyed in great numbers by the three following species of carnivorous Dipterous larvæ:—

1. *Phaonia cincta*, Zett. (Anthomyidæ, see Keilin, 1917, pp. 362–375).
2. *Systenus adpropinquans*, Loew (Dolichopodidæ).
3. *Systenus scholtzii*, Loew (Dolichopodidæ).

VII. PARASITES OF *DASYHELEA* LARVÆ.

The following is the list of the parasites which I have found in the larvæ of *D. obscura*:—

Fungi.

1. *Monosporella unicuspidata*, Keilin, 1920.—A parasitic yeast invading the whole body-cavity of the larvæ and destroying them before they succeed in pupating. The parasite is characterized by having the asci with only one acicular spore. There is only one other species of this genus: *M. bicuspidata*, Metchnikoff, discovered by Metchnikoff (1884) in *Daphnia magna.*

Sporozoa.

2. *Allantocystis dasyhelei*, Keilin, 1920.—An intestinal gregarine with elongated sausage-shaped cysts, living in the mid-gut of the larva between the peritrophic membrane and intestinal epithelium. This gregarine does not seem fatal to its host.

3. *Microsporidia.*—The alimentary tube and the salivary glands of the larvæ are sometimes invaded with a microsporidian parasite, which will be dealt with separately. This parasite destroys the epithelial cells of the organs, and appears to kill the larvæ before they succeed to pupate.

4. *Helicosporidium parasiticum*, Keilin, 1921, represents a completely new type of Protist which invades the fat-body, nerve-ganglia, and body-cavity of the larvæ. This parasite is very pathogenic and destroys a good number of *Dasyhelea* larvæ.

5. The perivisceral fat-body of the larva on two occasions showed the presence of a parasitic body resembling the trophic stage of a gregarine. This parasite will be described separately.

Nematoda.

6. In a few cases the larva of *Dasyhelea* contained a female of a nematode worm lying in the body-cavity. This nematode, of which I only know the females, seems to belong to the family of Mermithidæ.

VIII. HEREDITARY BACTERIAN SYMBIONT OF *DASYHELEA OBSCURA*, WINNERTZ.

All the larvæ of *Dasyhelea obscura* contain in their thorax four large bodies completely filled with bacteria. These four masses of bacteria grow with the larva and pass into the pupa and the adult fly. They are then transmitted to the eggs, and the small larvæ which hatch from the eggs already show the four bodies with bacteria in the perivisceral cavity of their thoracic segments. The complete account of this hereditary bacterian symbiont will be given in a separate paper.

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X. EXPLANATION OF THE PLATES.

[All the figures concern *Dasyhelea obscura*, Winnertz.]

Plate XIX.

Fig. 1. Head of a full-grown larva, seen from the side: *an.*, antennæ; *cl.*, clypeus; *h.*, hypopharynx; *l.*, labium; *M.*, maxillæ; *m.*, mandibles; *s.*, duct of salivary glands; *1-14*, fourteen pairs of sensory organs.

Fig. 2. Labrum, seen from the ventral side.

Fig. 3. Maxilla, seen from the side.

Fig. 4. Egg taken out of the uterus of the ♀, showing the gelatinous layer with small chitinous rods surrounding it.

Fig. 5. Antenna of the larva.

Fig. 6. Hypopharynx, seen ventrally: *l.*, lateral wing-like processes; *r.*, posterior ridge of the ventral plate; *rd.*, lateral bifurcated rods connecting the hypopharynx with the labium; *s.*, salivary duct; *v.*, ventral plate.

Fig. 7. Hypopharynx, seen laterally: *d.*, dorsal plate; *o.*, œsophagus; other letters as in fig. 6.

Fig. 8. Larva, full-grown, seen laterally.

Plate XX.

Fig. 9. Abdominal segments of the larva, showing the characteristic pigmented pattern.

Fig. 10. Labrum, seen dorsally.

Fig. 11. Posterior end of the larva, seen laterally, showing the hooks, *h.*, and the lateral protuberance, *p.*

Fig. 12. Posterior end of the larva, seen dorsally, showing 2 pairs of hooks.

Fig. 13. Posterior end of the larva, seen ventrally, showing 4 pairs of hooks.

Fig. 14. Posterior segment of the larva, showing the protruded rectal gills, *r.g.*
Fig. 15. Anterior portion of the pupa, seen ventrally: *l.3*, the third pair of legs; *p.h.*, prothoracic respiratory horns; *p.w.*, terminal protuberance of the wings.
Fig. 16. Sensory vestigial remains of thoracic legs of the larva.
Figs. 17 & 18. Abdominal hooks, with sensory hairs of the pupa.
Fig. 19. Abdominal segments of the pupa, seen dorsally.
Fig. 20. Posterior abdominal segment of the pupa.
Fig. 21. Respiratory prothoracic horns, showing the spiracular papillæ.

LVIII.—*Some undescribed Rhopalocera from Mesopotamia and N.W. Persia; and other Notes.* By N. D. Riley.

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The following notes are based on the very rich material brought from Mesopotamia and N.W. Persia by Lt.-Col. H. D. Peile, I.M.S., F.E.S. Col. Peile is to be congratulated highly on the excellent condition of the specimens, the fullness of the data, and on the number of species obtained, often under conditions not at all conducive to entomological enthusiasm. The Museum also is greatly indebted to him for the generosity with which he has presented not only the types of all the forms, but also "as many as we want of everything else."

Col. Peile hopes shortly to publish in the Journal of the Bombay Nat. Hist. Soc. a fuller account of the Rhopalocera of the regions in which he collected, and to figure the majority of the new forms. Fuller particulars as to dates and localities, &c., will be found therein. Only those specimens of the species mentioned below, which have been incorporated in the General Collection of the Museum, are referred to here.

Pieridæ.

1. *Euchloë ausonia persica*, Verity.

Rhop. Pal. p. 178 (1908).

7 ♂, 7 ♀, Fathah, R. Tigris, 19–30. iii. 1920.

Verity says of his type specimen: "La tache apicale, peu étendue, mais très noire et à limites très nettes, rappelle plutôt celle de *belemia*, tandis que le trait discoidal très réduit, très droit et aussi éloigné de la côte que chez *falloui*, a un aspect qu'on ne retrouve chez aucun autre *Euchloë*; ce trait a la même ampleur sur les deux surfaces."

This description fits exactly the specimens collected by Col. Peile, but its application by Verity to the specimens from Schahrud in the B.M., which he figures at plate 67, figs. 31 & 32, seems, in view of this additional material, no longer justifiable. The two features on which he lays stress are the sharp definition of the inner edge of the apical patch and the reduction of the size of the discoidal spot. In the Schahrud specimens the former is very broad and diffuse, the latter large and almost quadrate, in both sexes. This race from N.E. Persia may well be called VERITYI, sp. n., the types being the ♂ and ♀ in the B.M. figured by Verity, and *persica*, Ver., be restricted to the race from Western Persia, Kurdistan, &c.

B.M. types No. Rh. 161, ♂, 12. 5. 78; 162, ♀, 15. 5. 71, *Christoph*, ex *Coll. Elwes*, Shahrud, N.E. Persia.

2. *Zegris eupheme dyala*, Peile.

Entomologist, liv. p. 151 (1921).

26 ♂, 26 ♀, Kizil-Robat, L. bank of R. Dyala, 10. iii.–6. iv. 1919.

Resembles the f. *tschudica* in the whiteness of the apical area of the underside of the forewing, but can at once be separated from it by the far greater reduction in the extent of the green mottling of the underside of the hindwing. The orange patch is usually much smaller, and the grey apex very much blacker, than in f. *menestho*.

There are three pairs of typical *tschudica* in the B.M. from S. Russia, and all of them agree far better with Herrich-Schaffer's figure of *tschudica* than do these specimens from the R. Dyala. I suspect that the male mentioned by Le Cerf (Ann. d'Hist. Nat. ii. (2) p. 29, 1913), taken at Danah-Kouh in March 1903, is referable to this race rather than to true *tschudica*.

B.M. types No. Rh. 163, ♂, 23. 3. 19; 164, ♀, 15. 3. 19, Kizil-Robat.

2 *a*. *Zegris eupheme tigris*, subsp. n.

13 ♂, 4 ♀, Fathah, R. bank R. Tigris, 18. iii.–5. iv. 20.

This race, like the preceding, comes very close to *tschudica*, H.-S. It can, however, be separated at once from that form by the yellowness of the apical area of the underside of the forewing, this area being, in Herrich-Schäffer's figures (Schmett. Eur. ff. 449–353), white, with the exception of the extremes of the inner edge; uniformly yellow in *tigris*. The mottling of the underside of the hindwing also has considerably more yellow in its composition than is the case in true *tschudica*.

Two males approach *menestho* in the richness of the underside coloration; one approaches *dyala* in the poverty of it. The extent of the orange in the apical patch of the forewing above is, on the average, appreciably greater than is the case in *dyala*.

B.M. types No. Rh. 165, ♂, 25. 3. 20; 166, ♀, 30. 3. 20, Fathah.

Satyridæ.

3. *Pararge megæra iranica*, subsp. n.

2 ♂, Kizil-Robat, Mesopotamia, 23. 3. 19; 3 ♂, 6 ♀, Karind Gore and Harir, 13. vii.–16. viii. 18, N.W. Persia.

Underside of the hindwing lighter and more yellowish than in true *lyssa*, Bois., in that respect agreeing with Herrich-Schäffer's description of *megærina*. Herrich-Schäffers states, however, that the upperside of his *megærina* is that of Hübner's fig. 914, i.e. *lyssa*. The upperside of *iranica* is more that of Staudinger's *transcaspica*, i.e. with the much obscured hindwing, but the underside of the hindwing is much darker than in that form. The specimens are all rather smaller than the *transcaspica* and *lyssa* in the B.M.

B.M. types No. Rh. 167, ♂, 11. 7. 18; 168, ♀, 4. 7. 18, Harir.

In addition there are in the B.M. one pair from Dizful, Persia, and a further pair from Teheran which belong to this race. A pair from Gulek, Taurus, though much larger, agree in all other respects. It is probable, too, that the specimens mentioned by Le Cerf (*l. c.* p. 41), from Persia, should be referred to *iranica*.

The name *megærina* seems only tenable for the form of *lyssa* with a yellower underside to the hindwing. The "differences" given by Herrich-Schäffer for separating it are characteristics which apply equally to any form of *megæra*.

4. *Satyrus persephone*, Hübn. (*anthe*, Ochs.), and

5. *Satyrus enervata*, Staud.

As there seems to be some confusion as to whether *enervata* is a seasonal form or a geographical race of *persephone*, it may be as well to mention that not only, as its name implies, does it lack the white veining of the underside of the hindwing, but also its genitalia differ from those of *persephone*, and it has across the bases of areas 1 *b* (part) to 3 of forewing above in the male a prominent black sex-mark.

These seem sufficiently good grounds for maintaining it as a good species.

6. *Epinephele telmessia pallescens*, Butler.

Epinephele pallescens, Butler, Cat. Sat. B.M. p. 65 (1868).
E. telmessia var. *oreas*, Le Cerf, Ann. d'Hist. Nat. ii. (2) p. 46 (1913).

N.W. Persia, Karind Gorge, 13. 7. 18, 2 ♀; Paitak, 6. 3. 18, 1 ♀; Harir, 10. 8. 18, 1 ♀.

There seems little doubt that Le Cerf unfortunately overlooked Butler's description of *pallescens*, and that his *oreas* is the same thing.

7. *Epinephele lupinus* CENTRALIS, subsp. n.

15 ♂, 15 ♀, from Kizil-Robat, Jebel Hamrin; Suleimanyeh, Kermanshah, Harir, and Karind, iv., v., vi., vii., viii., & ix. 1918 & 1919.

Staudinger's description of "*E. lycaon* var. *intermedia*" runs as follows:—"The almost universally common species *E. lycaon* is a species very variable as to size, nature of hair-scales, colour, etc. The large examples from S.E. Europe with the forewing in the male more lightly covered with long hairs was described long ago as var. *lupinus*, Costa. In the lower-lying (hotter) districts of Asia and Asia Minor as well as in S. Russia (according to Alphéraky) an intermediate form occurs which I call *intermedia*. Specimens are much larger than typical German *lycaon* and almost as densely hairy as the still larger *lupinus*, but darker and mostly with a broader (shorter) androconial stripe (or, rather, patch) on the forewing. Also on the underside of the hindwing they are almost always much lighter (more greyish-white) than *lycaon*, especially examples from Samarkhand, almost like typical *lupinus*. I have this var. *intermedia* from Samarkhand, Margelan; also one specimen each from Saison and Lepsa (presumably taken in other hotter districts) I must include with them. In the same way examples from Amasia and Achal Tekke District would be best included here, although the Amasia specimens are darker on the underside."

From this typical Staudinger description it at least appears that true *intermedia* is the Samarkhand, Margelan race. Hence Turati's *margelanica* must fall as an absolute synonym of *intermedia*. In Mesopotamia, Kurdistan, and Western Persia occurs a race somewhat similar to *intermedia*, but characterized by its smaller size, greyer appearance (the females particularly being very dark above, with very little orange as a rule), and the greater uniformity of the markings of the underside of the hindwing, the banded appearance of *intermedia* being absent, or almost so, in the majority of specimens. This may be known as CENTRALIS, subsp. n. (types: B.M. types No. Rh. 169, ♂, 6. 5. 19; 170, ♀, 7. 5. 19, Kizil-Robat, L. bank of R. Dyala, *H. D. Peile*). Somewhat similar, but characterized by a very much darker underside to the hindwing, larger size, longer and yellower hair-scales occupying a more extensive area, is the Asia Minor race (CAPTUS, subsp. n., B.M. types No. Rh. 171, ♂, 1. 7. 18; 172, ♀, 24. 6. 18, Kedos, *N. V. L. Rybot*). This race is very intermediate between *lupinus* and *centralis* in all respects. It is also in the B.M. from Brussa, Kilishlar, Gulek, and Yozgat, and, according to Staudinger, occurs at at Amasia. Finally, the race from Cyprus may be mentioned. It represents the extreme in depth of coloration in both sexes above and below, with the only exception of the male of *mauritanica*, Oberth., which is blacker above. The female has, by comparison, an almost sooty appearance above and the yellow markings are of a very deep shade (=CYPRIACA, subsp. n., B.M. types, No. Rh. 173, ♂, 25. 5. 09; 174, ♀, 9. 5. 09, Nicosia, Cyprus, *J. A. Bucknill*).

Nymphalidæ.

8. *Melitæa trivia persea*, Koll.

12 ♂, 3 ♀, 16. 3. 19–3. 4. 19, Kizil-Robat. Spring brood.

2 ♂, 4 ♀, 27 & 28. 6. 18, Jebel Hamrin, L. bank R. Dyana. Summer brood.

1 ♂, Fathah, Jebel Hamrin, 19. 6. 20. Summer brood.

9. *Melitæa dedyma casta*, Koll.

1 ♂, 1 ♀, 12. 8. 18, Harir, N.W. Persia.

As Kollar's original descriptions of *M. casta* and *persea* are not usually very accessible, the following transcripts may be of use:—

Denk. K.-K. Akad. Wissen. Wien, i. p. 50 (1850).

Melitæa casta. Wings above fulvous, the costal strigæ of forewing and a broad [repanda] submarginal fascia common to both wings, and the margin itself, black; forewings below with an irregular macular black fascia; hindwings pale yellowish, with two very pale yellowish bands, the broad stripes and the series of black marginal spots less distinct.

Exp. 15‴-17‴.

Next to *M. didyma,* from which, however, it differs most in that the wings above have fewer black bands and spots, and that the bands of the underside of the hindwing have almost disappeared.

Melitæa persea. Wings above fulvous; forewings with three black macular bands, hindwings two; below, the apex of the former and the whole of the latter pale yellow, the macular bands of the forewings below conforming with those of upper surface, the hindwings with two pale fulvous bands and black lunules and spots.

Exp. alar. 17‴.

Similar to the preceding, but the markings of the hindwings on the underside, which in *casta* are very similar to *didyma,* in this manfestly differ and *come closer to M. didyma* [*sic* !], from which, however, it ought to be separated, owing to the failure of the black spots, especially at the bases of the wings.

Taking these two descriptions together, remembering that Kollar also records *M. phoebe* from the same locality, and assuming, I think with perfect justification, that the passage in the above paragraph in italics must refer to some other species, *not didyma,* it seems reasonable to suppose that *casta* must be the Persian race of *didyma* and *persea* that of *trivia.* This view is much strengthened by the material in the B.M.

A character which may be found of some use in separating these two species is the position of the black marks in areas 2 and 3 of the hindwing underside, between the orange bands. These markings are generally, in each area, three in number, and in *trivia* the middle one is nearer the distal one, in *didyma* nearer the proximal one.

10. *Polygonia egea,* Cram., f. *egea.*

Karind Gorge, 13. 7. 18, 17. 7. 18, & 12. 8. 18, each 1 ♂.

f. *j-album,* Esp.

Karind Gorge, 14. 7. 18, 17. 7. 18, each 1 ♂.

11. *Polygonia c-album*, Linn., f. *hutchinsonii*, Robson.

Karind Gorge, 12. 8. 18; 1 ♂.

It will be noticed that all three forms mentioned above were taken at the same locality within a week.

It may be of interest here to publish a note on the Central Asiatic forms of this genus made by M. Andre Avinoff shortly before the war and left at the B.M.; it should help to clear up the muddle which surrounds *P. interposita*, Staud. It runs:—"*Polygonia egea* (*triangulum*) is found in Europe; in the south begins, from Caucasus, to get darker and gradually runs into the form of Central Asia. It is not the *interposita* of Staudinger, as the *interposita* is the *c-album* form with some character of *egea* (I saw the type and studied the form by the Turkestan material). Grum-Grshmailo gave the name *undina* (Rom. Mem. iv. p. 424) to the *egea* of Turkestan, but he was not quite right on the distribution (all he says about Osch and Margelan). In reality *undina* goes to Chitral by Bokhara and flies with *interposita*. The series of the B.M. contain both species; *egea* does not go to the south. *Interposita* is darker in Chitral, Goorais, Thundiani (*cognata*), and brighter and less dark in the South Himalayas (Nepal, Sikkim to Ta-Tsien-Lu), where it is *agnicula* (*tibetanus*, Elwes). *Interposita* is very near to *c-album*, but it may be a distint species."

From this, the series in the B.M., and indeed from Staudinger's original description (Stett. Ent. Zeit. 1881, p. 286), it is evident that *interposita* has nothing to do with *egea*, although almost invariably associated with it by authors. Staudinger's description certainly is discursive to a degree, but it is obvious he regarded *interposita* as a closer ally of *c-album* than of *egea*. What has hitherto been generally known as *interposita* must in future go by the name *undina*, Gr.-Gr.

The position in the Himalayas seems to be that there are three species, represented in the B.M. as follows:—

1. *P. egea undina*, Gr.-Gr.,	from Chitral and Hunza.
2. *P. c-album cognata*, Moore,	„ Thundiana, Kulu, Nandar, Simla, and Chumpur.
3. *P. interposita interposita*, Staud.,	„ Chitral, Ladakh, Kylang, Kulu, Goorais, Pangi, Dugi, Goolmurg, and Gurwhal.
3*a*. *P. interposita agnicula*, Moore (*tibetanus*, Elwes).	„ Nepal, Sikkim, Tibet to Ta-Tsien-Lu.

It may be as well here to correct a further error, for which Stichel (in Seitz, Macrolep. Pal. i. p. 208) appears to be responsible, with regard to the Japanese forms of *c-album*. *Fentoni*, Butler, is not a synonym of *hamigera*, Butler ; it is an older name than *lunigera*, Butler, for the form with the light brown underside. *Lunigera* was based on a specimen of this form with slightly narrower forewings and more melanic upperside—an extreme of the form, in fact.

Lycænidæ.

12. *Lycæna dama* KARINDA, subsp. n.

7 ♂, 7 ♀, 14. 7. 18.–9. 9. 18, Harir, Karind, and Karind Gorge, N.W. Persia.

Differs from *L. dama*, Staud. (Iris, iv. p. 234), in that the discal series of spots on the underside of hindwing is always complete, although the spots composing it are minute. The marginal and submarginal markings also are more fully developed. In the female the veins on the upperside are conspicuously darker.

Le Cerf (Ann. d'Hist. Nat. ii. (2) p. 69) records one female, under the name *dama*, from Deh-Tchechma, Arabistan Persia. This should probably be referred to *L. dama karinda*, typical *dama* being only known from Malatia.

B.M. types No. Rh. 175, ♂ ; 176, ♀, 16. 7. 18, Karind Gorge.

13. *Lycæna damone* DAMALIS, subsp. n.

12 ♂, 12 ♀, Karind Gorge and Harir, 13. 7. 18–9. 8. 18.

Nearest the var. *xerxes*, Staud., in colour and in that the hindwing underside is entirely devoid of any trace of the longitudinal white stripe, but differs constantly in its much larger size (30 mm. and more as against 23–24 mm. in *xerxes*), and in being entirely devoid of any trace of basal green scaling on the underside of both wings. The upperside coloration of the male is perhaps a shade paler and brighter than in typical *xerxes*, and the hind-marginal orange lunules in the female more pronounced. The general coloration of the underside in the male is lighter, more greyish, less brown than in *xerxes* ; in the female of a more yellowish brown. The discoidal spot on the forewings is anteriorly more acute than in any *xerxes* examined.

B.M. types No. Rh. 177, ♂, 13. 7. 18 ; 178, ♀, 16. 7. 18, Karind Gorge.

14. *Lycæna peilei*, Beth. Baker.

Entomologists' Record, xxxiii, p. 63 (1921).

B.M. types No. Rh. 179, ♂; 180, ♀; 17. 7. 18, Karind Gorge.

15. *Heodes thersamon* KURDISTANICA, subsp. n.

18 ♂, 18 ♀, 15. 7. 18–14. 9. 18, Harir, Karind Gorge, and Kermanshah.

These specimens, especially the September ones, are characterized by their small size and the lack of any fiery tinge in their coloration. They are also a much more yellow-gold even than usual in European *thersamon*, though not nearly so golden as *ochimus*.

The underside coloration is more uniform than in typical *thersamon*, the hindwing ground-colour approaching that of the forewing, and the dark spots are much reduced in size. The hindwing tails are comparatively long.

Var. *persica*, Bienert, was described from N.E. Persia. It can at once be separated from *kurdistanica* by its large size, its fiery reddish-golden colour, and its dark border.

B.M. types No. Rh. 181, ♂, 19. 8. 18; 182, ♀, 20. 8. 18, Harir.

16. *Aphnæus epargyros* MARGINALIS, subsp. n.

2 ♂, 6 ♀, 6 & 7. 8. 18, Paitak; 2 ♂, 1. 9. 19, Suleimanyeh.

Differs from typical *epargyros* (as represented in the B.M. by 13 males and 8 females from Persia, Turkestan, &c.), which was described by Eversmann from the Aral Sea area, by its much smaller size, darker ground-colour, and the great increase in the size of the black markings above. The submarginal band of the forewing so wide as to join the marginal line, thus forming a broad black band which, posteriorly, joins the median transverse band. The triangular patch of ground-colour so enclosed is nearly half filled by four spots between vein 4 and the costa. The black markings of the hindwing are correspondingly larger.

On the underside the ground-colour is greenish grey, not silver-grey as in typical *epargyros*, and the irregular blotches, which in *epargyros* are ochreous, are similarly slightly greenish. The blotches themselves are more rounded, neater, and the whole underside has a more delicate appearance than in typical *epargyros*.

B.M. types No. Rh. 183, ♂; 184, ♀, 6. 8. 18, Paitak.

N.B.—Since its description by Eversmann in 1854, *epargyros* has always been regarded as a synonym of *acamas*, Klug, which it is not, as the original descriptions and figures clearly prove. *Acamas* always has the base of the forewing as far as the origin of vein 2, and usually the whole (or greater part) of proximal half of hindwing, grey ; in *epargyros* the yellow ground-colour extends right up to the base of the wings. In *epargyros* any lighter yellow area on the forewing is confined to area 6 ; in *acamas* these lighter areas are sometimes white, and may extend into the cell and areas 5 and 4. But the readiest means of separating the two species is by the shape of the submarginal band of the forewing below. In *acamas* this is an even band (or comparatively so) with a straight inner edge, or bordered internally by a series of narrow straight lines; in *epargyros*, as stated very clearly by Eversmann, it is made up of a series of decided crescents, their convex sides inward.

Typical *acamas* can be separated from its better-known Indian form *hypargyros* by its brighter colour and its much less heavily marked upperside, and also by the underside markings, which are cloudier than in *hypargyros*. It appears to be confined to Syria and Arabia, and has a softer general appearance than its Indian form.

Swinhoe's figures of *A. acamas* in Lep. Ind. pl. 734 are misleading. Figs. 1 and 1 *b* are from a male of *A. epargyros* of the typical form from Persia ; fig. 1 *a* is from an apparently very dry form of *A. acamas hypargyros* from Chaman. Both specimens are in the B.M.

17. *Zephyrus quercus* LONGICAUDA, subsp. n.

13 ♂, 13 ♀, 13. 7. 18–7. 8. 18, Paitak, Harir, and Karind Gorge.

A well-marked local race. It is distinguished from the typical European *quercus* most readily by its generally rather larger size, the brighter and more brilliant colour of the upperside of the male, and the great increase in the length of the tails. These measure 3–4 mm. consistently, as against 1–2 in European specimens. On the underside the general coloration is much lighter grey and the transverse white bands much straighter. The submarginal markings of the forewing below, with the exception of those in areas 1 *b* and 2, which are large, dark, and prominent, are almost absent. The anal lobe of the hindwing is much larger than in typical *quercus*, and the black spot which covers it twice the size.

B.M. types No. Rh. 185, ♂, 186, ♀, 16. 7. 18, Karind Gorge.

Three males and two females, one of the latter a beautiful example of ab. *bellus*, Gerhard, taken at Suwarra by Capt. Aldworth in early July 1919, and one male from Lenkoran, 30. 6. 74, *ex* coll. Christoph., all of which are in the B.M., are also referable to *longicauda.*

18. *Strymon* MARCIDUS, sp. n.

1 ♀, 15. 7. 18, Harir, B.M. type No. Rh. 187.
1 ♀, 16. 7. 18, Karind Gorge.

♀. *Upperside, both wings*:—Dark brown, immaculate, a fine darker anteciliary line more conspicuous on the hindwings, cilia whitish, especially on the hindwings. *Hindwing*: Anal lobe yellowish, and some yellowish scaling close to margin in areas 1 *b* and 2. *Underside, both wings*:—Pale yellowish grey, cilia of same colour, preceded by a very fine darker marginal line, which is separated from a very indistinct submarginal shadowy dusky band by only a narrow white line. *Forewing*: A band of white linear spots runs from costa to vein 1, the spots being limited by the veins and inwardly margined with black, the band following almost exactly the curve of the hind margin; the lowest spot, in area 1 *b*, is characteristic, being crescentic, the concave side facing outward, and as fully developed as the other spots in the series. *Hindwing*: The transverse band is similar to that of the forewing, but slightly broader and less interrupted; it follows almost exactly the curve of the hind margin, and in areas 1*c*, 2, and 3 is composed of V-shaped spots, the apex directed inward. There is also a submarginal series of spots, of which that in area 2 is large and black, inwardly bordered with yellow, black, then white; those in areas 3, 4, and 5 are small, black, ringed with paler, diminishing in size so that the one in area 5 is barely traceable. Anal lobe black, with some whitish and yellowish scaling above it which merges into the last spot of the transverse white band. Between anal lobe and the large spot in area 2 there is black and bluish-grey scaling, the exact nature of which, however, cannot be stated, as the bulk of this area in both specimens is completely missing.

Length of forewing: 16 mm.

Comes near *S. abdominalis*, Gerhard, but the different contour of the transverse band of underside and the absence of the dark marks at anal angle of forewing beneath readily separate it from that species.

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No. 48. DECEMBER 1921.

LIX.—*On some Dipterous Larvæ infesting the Branchial Chambers of Land-crabs.* *By* D. KEILIN, Sc.D., Beit Memorial Research Fellow (from the Quick Laboratory, University of Cambridge).

To the great variety of conditions under which Dipterous larvæ of different kinds are found, Baylis (1915) * has added an interesting record by his discovery of a novel habitat, namely, within the branchial chambers of certain land-crabs.

The record is as follows :—

(1) Of three specimens of a land-crab—*Cardiosoma hirtipes*—from the Admiralty Islands ('Challenger' Collection), two were found to contain Dipterous larvæ within their branchial chambers.

(2) A fragment of a Dipterous larva was found adhering to the external surface of an example of the same species from Christmas Island, near to the lateral opening of the gill-chamber.

(3) Two small Dipterous larvæ were found in the branchial chamber of one of three specimens of a land-crab—*Gecarcoidea lalandii*—from Christmas Island (collected by Dr. R. Kirkpatrick).

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* Baylis, H. A. (1915). "A parasitic Oligochæta and other Inhabitants of the Gill-chamber of Land-crabs," Ann. & Mag. Nat. Hist. ser. 8, vol. xv. pp. 378–383

Mr. F. W. Edwards has suggested that the specimens probably belong to the subfamily Eristalinæ.

In his note Baylis expresses some doubt as to whether or not these larvæ can be actually parasitic; he believes it is possible that the larvæ may have been living in the decaying matter upon which the crabs feed, or that they frequent the water of streams into which the crabs may go, but, whether their presence in the branchial chambers of their hosts is accidental or not, "they would appear to have thriven there, and it is suggested as at least a possibility that they derived sustenance from the blood of the crabs, their chitinous 'jaws' enabling them to puncture the epithelium of the gills or of the vascular lining of the chamber" (p. 380).

Mr. F. W. Edwards has kindly invited me to examine these larvæ discovered by Baylis, in order that, by comparison with other Dipterous larvæ, their true systematic position might be determined, and an explanation found, if possible, for their presence in the gill-chambers of their hosts. The results of my investigation are embodied in this communication.

Mr. Edwards sent me two tubes of material, the contents of which, for convenience in the following descriptions, I shall designate by the letters A and B respectively. The first tube contained larvæ from the branchial chambers of *Cardiosoma hirtipes* (Admiralty Islands), while the second tube contained a single larva from *Gecarcoidea lalandii* (Christmas Island).

Description of Larvæ A, from the Branchial Chambers of Cardiosoma hirtipes.

The tube contained two small and two large larvæ, all being already in the third stage of development. In each case the body is very elongate, and furnished posteriorly with a long respiratory siphon. The large larvæ (figs. 1 and 2), with completely evaginated siphons, attain a length of 19 to 22 mm., while their diameter at the widest part is only 0·7 to 1 mm. In common with other Cyclorhaphous Diptera, the body comprises a small head, three thoracic, and eight abdominal segments. The head, or *pseudocephalon*, resembles in structure that of all the larvæ of the Cyclorhapha (fig. 8); it is a small, soft, bilobed segment which can be retracted into the thorax, and is furnished with four pairs of sensory organs: (*a*) the bell-shaped *antennæ*; (*b*) *maxillary palps*, composed of several small papillæ; (*c*) *special sensory organs*, similar to those previously described by me

(1915, pp. 173–177 *), and which are present in all Cyclorhaphous larvæ; and (*d*) *labial palps* in the form of small conical protrusions, each of which bears a single circular papilla. The ventral surface of the head-lobes is raised in several rows of rib-like projections, armed with strongly chitinised, bifid, reflexed hooks. Each of the three *thoracic segments* bears on its anterior part several sinuous rows of small hooklets and a definite number of sensory hairs and pits. The vestigial remains of the thoracic legs are represented by six groups, each consisting of three small sensory hairs. The prothoracic segment bears the pair of well-developed anterior spiracles. The first seven *abdominal segments* are twice as long as broad; they present a doubled appearance, owing to the conspicuous zone of articulation, where the segments are telescoped into each other. Each segment bears at its anterior border several sinuous rows of small reflexed hooklets. On the ventral surface of the eighth and last abdominal segment is the anus, which divides the segment into an anterior portion resembling that of the preceding abdominal segments and a posterior portion which is prolonged into the respiratory siphon. The proximal portion of the siphon resembles the corresponding portion of an ordinary abdominal segment; it becomes narrower posteriorly, forming an intermediate portion which is covered with small, forwardly-directed hooklets. The terminal portion of the siphon is slender, rigid, and tubular, and bears the pair of postabdominal spiracles at its extremity.

The respiratory system of this larva is amphipneustic; two pairs only of functional spiracles are present—the prothoracic and the postabdominal pairs. The *prothoracic spiracles* (fig. 3, *s*) comprise eight elongated papillæ which, by means of a well-developed felt-chamber, communicate with the two lateral tracheal trunks. The *postabdominal* spiracles (fig. 4) are situated at the extremity of the respiratory siphon, and, on account of the tip of the latter being bifurcated, are separated from one another by a fairly deep groove. Each spiracle appears to possess three spiracular clefts, surrounded by long divergent hairs. The felt-chamber, through which the spiracles communicate with the tracheal trunks, is very long and narrow.

The *bucco-pharyngeal organ* (fig. 3) shows the structure typical of all the Cyclorhaphous Diptera; it is comprised of

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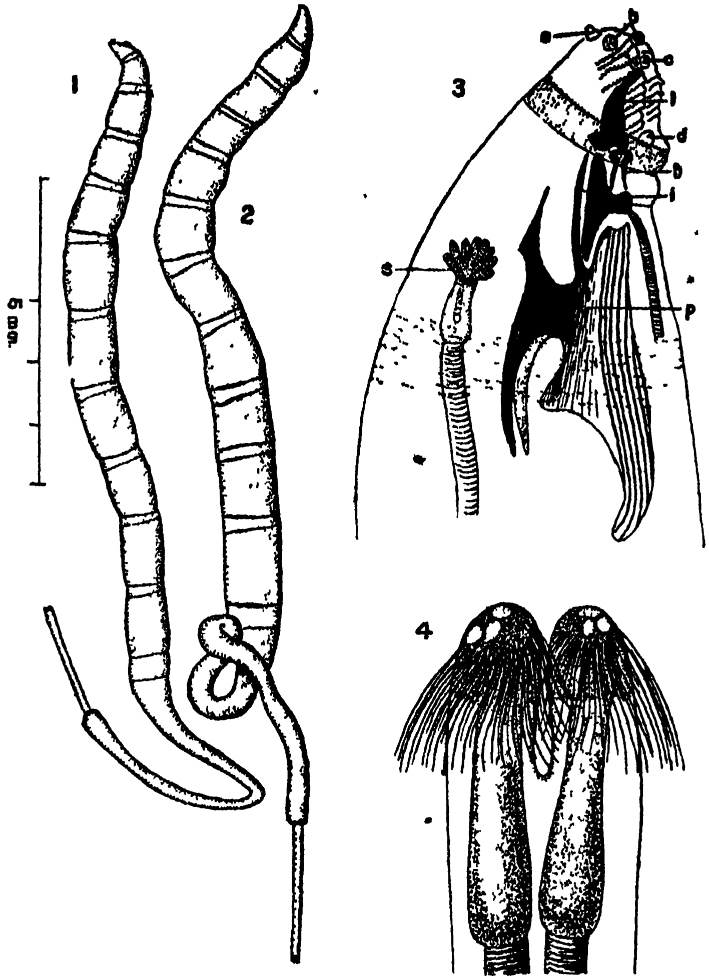
* Keilin, D. (1915). "Recherches sur les larves de Diptères Cyclorhaphes," Bull. Scient. de la France et Belgique, 7ᵉ série, vol. xlix. pp. 15–102.



Larva A: Figs. 1 and 2.—Full-grown larvæ, seen laterally. Fig. 3.—Anterior portion of the larva, showing the thoracic segments, the head or the pseudocephalon, and the bucco-pharyngeal armature: *a*, antenna; *b*, maxillary palps; *c*, ventral sensory organ; *d*, labial palp; *h*, hypopharyngeal sclerite; *i*, intermediate sclerite; *l*, lateral hooks; *p*, basilar or pharyngeal sclerite; *s*, prothoracic spiracles. Fig. 4.—Posterior end of the siphon, showing the postabdominal spiracles. The scale represents only the magnification of the figs. 1 and 2.

three main portions :—(1) the *basal* or *pharyngeal sclerite* (*p*), the lateral parts of which are strongly chitinised, while the ventral part, which forms the floor of the pharynx, is thin, transparent, and thrown into longitudinal ridges which project into the pharyngeal lumen ; (2) the *intermediate sclerite* (*i*), in the form of an H, its anterior space being occupied by a *hypopharyngeal sclerite* (*h*) ; (3) the *lateral hooks* (*l*), which are well developed and each provided with a single tooth only.

Description of Larva B, from the Branchial Chamber of Gecarcoidea lalandii.

The single specimen of this larva which I have been able to examine is in the second stage. It measures 2·3 mm. by

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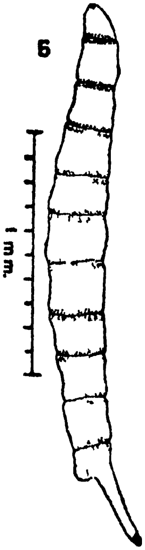

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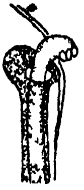

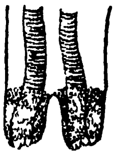

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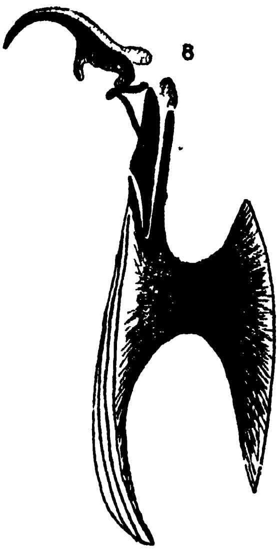


Larva B: Fig. 5.—The larva seen laterally. Fig. 6.—Prothoracic spiracle during the moulting. Fig. 7.—Postabdominal spiracles. Fig. 8.—Bucco-pharyngeal armature. The scale represents only the magnification of fig. 5.

0·25 mm. Its body also is comprised of a small *pseudocephalon*, three *thoracic*, and eight *abdominal* segments (fig. 5). The anterior and posterior margins of each segment bear several sinuous rows of small hooklets. The last abdominal segment is prolonged beyond the anus so as to form a respiratory siphon similar to, but much shorter than, that of larvæ A. The larva is amphipneustic; the prothoracic spiracles (fig. 5) protrude slightly externally and show traces of the spiracular papillæ, whose number I could not determine. As in Larvæ A, the respiratory siphon is bifurcated at its extremity, and, in consequence, the postabdominal spiracles are separated by the groove of the bifurcation (fig. 7). The *bucco-pharyngeal armature* of this specimen resembles that of Larvæ A, but the sclerites are relatively more slender (fig. 8).

The Systematic Position of Larvæ A and B.

As already mentioned, these larvæ had been associated by Mr. F. W. Edwards with the Eristalinæ (Syrphidæ). He supplied, moreover, the following information (see Baylis, p. 379):—"Dipterous larvæ from *Cardiosoma hirtipes.*—These larvæ are evidently Syrphidæ, and apparently belong to the subfamily Eristalinæ; they differ from *Eristalis* in the more elongate form and the lack of any obvious separation into 'body' and 'tail.'

"Larvæ from *Gecarcoidea lalandii.*—These are also Syrphidæ, but in the present state of our knowledge it is impossible to assign them definitely to any subfamily. They appear to lack the extensile 'tail' of *Eristalis.*"

The foregoing remarks show that Edwards was guided in his identifications solely by the general conformation of the body, and especially by the presence of a well-developed postabdominal respiratory siphon. As a matter of fact, the resemblance between larvæ A and an Eristaline larva is most remarkable. It must be remembered, however, that the possession of a postabdominal siphon is merely evidence of the fact that the larva inhabits a fluid or semi-fluid medium, and the greatest caution must be exercised before making use of it as a character for the purpose of systematic classification. A well-developed postabdominal respiratory siphon is known to exist in many totally different groups of Dipterous larvæ, *e.g.*, Ptychopteridæ, Psychodidæ, Culicidæ, Stratiomyidæ, Phoridæ, Eristalinæ (Syrphidæ), Anthomyidæ, Ephydridæ, Drosophilidæ, and others.

Being specially interested in the structure of Eristaline larvæ, I have had occasion to examine many examples of this subfamily, and, from my knowledge of their morphology, I am forced to the conclusion that the larvæ under consideration have no affinity whatever with the Eristalinæ, nor indeed with the Diptera Aschiza in general. For the purpose of comparison, I tabulate below some of the more important differences between Eristaline larvæ and these examples from the gill-chambers of crabs:—

Eristaline larvæ.	*Larvæ A and B.*
(1) Siphon not bifurcated, posterior spiracles adjacent.	(1) Siphon bifurcated, posterior spiracles separated.
(2) Prothoracic spiracles of small size.	(2) Prothoracic spiracles well developed in larvæ A, larva B is in the second stage only.
(3) Antenna and maxillary palp united to form a single sensory organ.	(3) Antennæ and maxillary palp distinctly separated.
(4) Bucco-pharyngeal apparatus exhibiting a special structure, quite different from the type usually found in Diptera Cyclorhapha.	(4) Bucco-pharyngeal apparatus of the ordinary type common to all Cyclorhapha Schizophora.

All this shows that the resemblance between the larvæ A and B and the Syrphid larva is only a superficial one—it is nothing more than a case of convergence.

The question now arises: What is the correct systematic position of these larvæ?

In the existing state of our knowledge of the larvæ of Cyclorhaphous Diptera, it is always difficult, and often impossible, to determine even the family to which a particular example belongs. Nevertheless, the structure of the head, mouth-parts, and spiracles indicate, first of all, that the larvæ A and B belong to the Diptera Cyclorhapha Schizophora. They appear to show a close affinity with the the family Ephydridæ—this for the following reasons:—

(1) Larvæ of the Ephydridæ, like larvæ A and B, are always provided with postabdominal respiratory siphons.

(2) In this family the siphon is always bifurcated as in larvæ A and B.

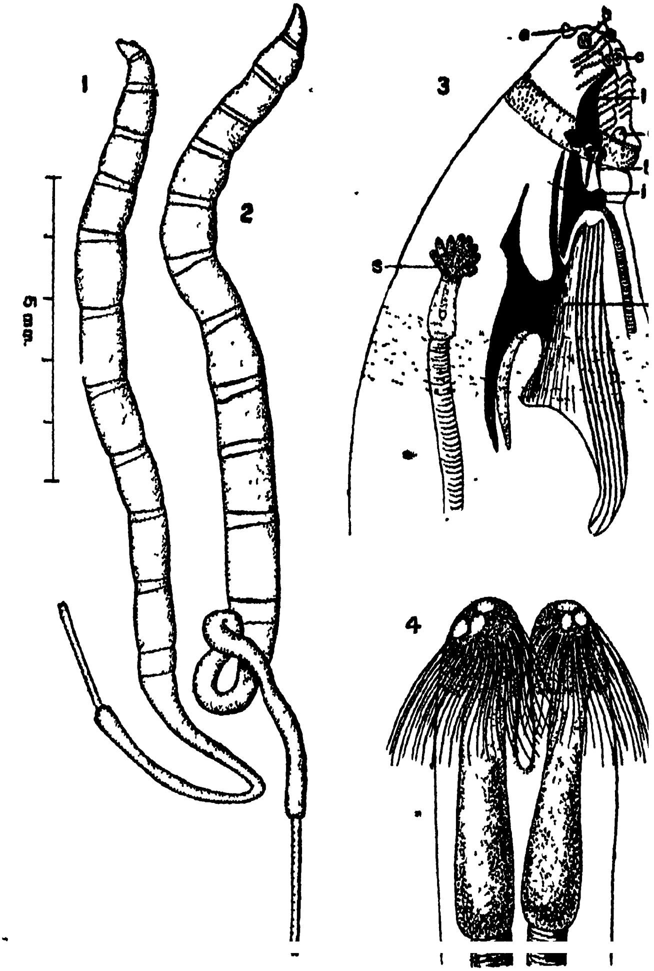
(3) The prothoracic spiracles are well developed in the Saprophagous Ephydrid larvæ, similar to those of larva A.

(4) The mouth-parts of larvæ A and B are of the Ephydrid type.

(5) The ventral surface of the head in Ephydrid larvæ, as in larva A, is furnished with plates and dentate scales.

(6) Several species of Ephydrid larvæ are known to occur in salt or brackish water.

It is, therefore, highly probable that the larvæ A and B, discovered by Baylis, belong to the family Ephydridæ, or, at least, are very closely allied to that family.

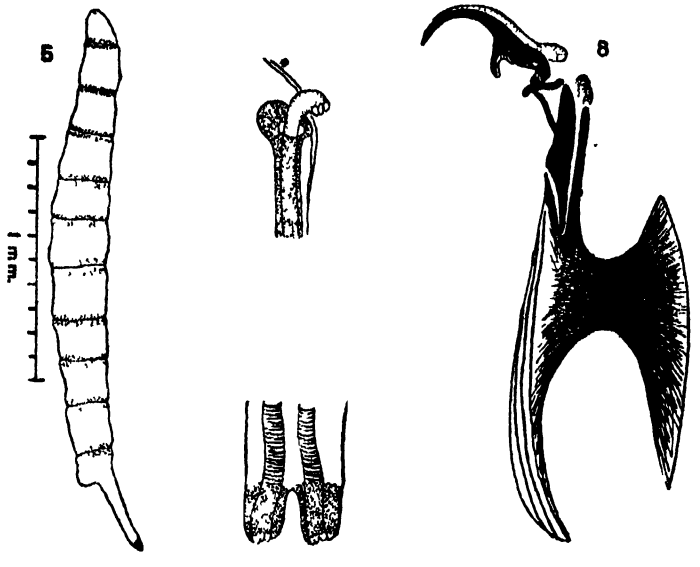


Larva A: Figs. 1 and 2.—Full-grown larvæ, seen laterally. Fig. 3.—Anterior portion of the larva, showing the thoracic segments, the head or the pseudocephalon, and the bucco-pharyngeal armature: *a*, antenna; *b*, maxillary palps; *c*, ventral sensory organ; *d*, labial palp; *h*, hypopharyngeal sclerite; *i*, intermediate sclerite; *l*, lateral hooks; *p*, basilar or pharyngeal sclerite; *s*, prothoracic spiracles. Fig. 4.—Posterior end of the siphon, showing the postabdominal spiracles. The scale represents only the magnification of the figs. 1 and 2.

three main portions:—(1) the *basal* or *pharyngeal sclerite* (*p*), the lateral parts of which are strongly chitinised, while the ventral part, which forms the floor of the pharynx, is thin, transparent, and thrown into longitudinal ridges which project into the pharyngeal lumen; (2) the *intermediate sclerite* (*i*), in the form of an H, its anterior space being occupied by a *hypopharyngeal sclerite* (*h*); (3) the *lateral hooks* (*l*), which are well developed and each provided with a single tooth only.

Description of Larva B, from the Branchial Chamber of Gecarcoidea lalandii.

The single specimen of this larva which I have been able to examine is in the second stage. It measures 2·3 mm. by



Larva B: Fig. 5.—The larva seen laterally. Fig. 6.—Prothoracic spiracle during the moulting. Fig. 7.—Postabdominal spiracles. Fig. 8.—Bucco-pharyngeal armature. The scale represents only the magnification of fig. 5.

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(4) The mouth-parts of larvæ A and B are of the Ephydrid type.

(5) The ventral surface of the head in Ephydrid larvæ, as in larva A, is furnished with plates and dentate scales.

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It is, therefore, highly probable that the larvæ A and B, discovered by Baylis, belong to the family Ephydridæ, or, at least, are very closely allied to that family.

As to whether or not these larvæ are parasitic in their habitat is a matter of some doubt. It is probable that they live in salt or brackish water, and that their presence in the branchial chambers of crabs is purely accidental. The structure of their bucco-pharyngeal organs, and especially their possession of well-developed longitudinal pharyngeal ridges, show that they are, to some extent at least, saprophagous (*see* Keilin, 1915, *l. c.* pp. 127–132). They probably feed on the detritus of variable nature, which they find in the branchial chamber of crabs, but it cannot be denied that they may also obtain food, in the form of blood or mucus, from the gills of the crab, by inflicting wounds with their well-developed lateral hooks and the dentate process on the ventral surface of the head.

LX.—*On a further Collection of Mammals from Jujuy obtained by Sr. E. Budin.* By OLDFIELD THOMAS.

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DURING April, May, and June of this year Sr. E. Budin returned to the region where his first collection had been made in 1913, as he knew of a number of species which he had not succeeded in obtaining, and of which he wished to procure examples.

In this respect he was exceedingly successful, as the present collection, consisting of one hundred and seventeen specimens, included examples of no less than five new species, besides nice sets of various other forms which had been previously obtained by him in this and neighbouring provinces.

How much Sr. Budin has contributed to our knowledge of the mammalogy of this region is shown by the fact that of twenty-two species in the present collection no less than fifteen have been now or previously discovered by him, while of the thirty others from Jujuy sent in earlier collections he was the discoverer of eighteen, so that he is the first captor of no less than thirty-three of the known mammals of Jujuy.

Of the collection now dealt with the most interesting are the squirrel, never obtained before in the Argentine *, and the *Neotomys*, a swamp-rat congeneric with a Peruvian species, and a very striking addition to the fauna of Jujuy.

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* Though recorded, on the evidence of natives and of gnawed nutshells, by Matschie, SB. Ges. Nat. Fr. 1894, p. 61.

The three localities at which the specimens were obtained were:—

Alfarcito.—2600 metres altitude, situated about 15 km. N.E. of Maimara, the place where Sr. Budin first collected.

Sierra de Zenta.—Altitude 4500 m., a range of mountains running north and south along the eastern edge of the Tilcara Department.

Higuerilla.—2000 m., in the Department of Valle Grande, about 10 km. east of the Zenta range and 20 km. of the town of Tilcara.

1. *Pseudalopex culpæus*, Mol.

♀. 1410. Alfarcito, 2600 m.
♀. 1455. Sierra de Zenta, 4500 m.

2. *Conepatus ajax*, Thos.

♂. 1411. Alfarcito, 2600 m.

3. *Sciurus* (*Mesosciurus*) *argentinius*, sp. n.

♂. 1496, 1506, 1516; ♀. 1495, 1504, 1512, 1513. Higuerilla, 2000 m.

A yellow-bellied squirrel with a strong resemblance to *S. hoffmanni* and *griseogena* of northern S. America.

Size about that characteristic of Allen's *Mesosciurus.* Fur rather short and coarse, hairs of back (winter) about 11–12 mm. in length. General colour above buffy olivaceous brown, approaching "Dresden brown," the colour quite like that of many specimens of true *hoffmanni.* Under surface clear "ochraceous buff," the hairs this colour to the roots; demarcation on sides rather sharply defined. Eyes with their upper and lower lids buffy. Ears rich reddish (near "vinaceous tawny"), a patch behind them cinnamon-buff. Hands and feet strong buffy, like belly. Tail broadly washed with strong buffy or ochraceous buffy to the tip, the hairs mostly black at base, then buffy, with a black subterminal band and buffy tip. No tendency to a blackish tail-tip, the terminal hairs being the most broadly washed with buffy of all.

Skull of about the size of that of *S. hoffmanni*, but it is less bowed and convex above, and (perhaps as a consequence) the incisors are rather more directed forwards (index 87°–90°, as compared with 80°) than in other members of the group.

Dimensions of the type (measured by collector):—

Head and body 189 mm.; tail 195; hind foot 47·5; ear 27.

Skull: greatest length 51·5; condylo-incisive length 47; zygomatic breadth 30; nasals 16 × 7·8; interorbital breadth 17·4; upper cheek-tooth series 8·6.

Hab. as above.

Type. Adult female. B.M. no. 21. 11. 1. 8. Original number 1504. Collected 15th June, 1921.

The capture of this squirrel by Señor Budin is of great interest, for, although an animal believed (and, we now know, rightly believed) to be a squirrel was recorded for Jujuy by Matschie, no determinable specimens have previously been obtained, and the nearest locality to the present hitherto certainly known for them is Northern Bolivia (Sta. Cruz de la Sierra). And even there the squirrel is of the "*Leptosciurus*" group, the nearest localities for *Mesosciurus* being Peru and Colombia. And the species most like the present is the *S. griseogena*, far away in Venezuela.

Besides the difference in the locality and the absence of any blackening of the tail-tip, *S. argentinius* is distinguished by its conspicuously reddish ears, a character not known in any of its allies.

Dr. Allen's great paper on S.-American squirrels being naturally the chief work of reference about them, I provisionally use his "*Mesosciurus*" as a subgenus, but I should very much doubt if it ought to be considered subgenerically distinct from the far-earlier *Guerlinguetus*, and should in any case not recognize either *Guerlinguetus* or *Mesosciurus* as a genus distinct from *Sciurus*, with which teeth, penis-bone, and general structure all fully agree.

In connection with this squirrel I should like to express my sense of the great loss science has sustained in the death of Dr. Allen, who had worked so much at this group. Both personally and by correspondence he has been one of my most valued friends and helpers, and the loss of so enthusiastic a worker makes a sad gap in the ranks of mammalogists.

Sr. Budin says of this squirrel:—"Native name 'Nuecero' (which means walnut-eater). I have had much pleasure in obtaining these animals which I have long wished to send. They live among the walnut-trees, and I have had an opportunity of seeing one go into a hole made by the large woodpecker (*Campophilus leucopogon*), where it had its nest. They are rare and difficult to see, as at sight of an enemy they remain perfectly still, and are then almost invisible among the branches. All those sent were shot, as I have found it impossible to trap them."

4. *Oryzomys* sp.

♂. 1462, 1476, 1494; ♀. 1471, 1474, 1483, 1498, 1502. Higuerilla, 2000 m.

5. *Andinomys edax*, Thos.

♂. 1414, 1417. Alfarcito, 2600 m.
♂. 1429; ♀. 1432. Sierra de Zenta, 4500 m.

6. *Phyllotis nogalaris*, sp. n.

♂. 1472, 1485. Higuerilla, 2000 m.

A large species of rather dark colour.

Size large, only exceeded by *Ph. magister.* General colour of the usual grizzled greyish, but darker than usual, about as in dark specimens of *Ph. tucumanus.* Under surface dull whitish, slightly tinged with buffy, which may form a definite patch on the chest. Ears rather smaller than usual, dark brown. Hands and feet white. Tail long, blackish above and at the end, dull white for the proximal half below.

Skull nearly as large as that of *magister*, its upper outline evenly convex, the middle part of the skull high. Interorbital region very narrow, with well-marked vertically projecting edges, which add to the vertical height of the skull; these, however, have no resemblance to the divergent horizontal beads characteristic of the genus *Graomys.* Zygomatic plate with sharply cut straight front edge. Bullæ proportionately rather small.

Dimensions of the type:—

Head and body 147 mm.; tail 164; hind foot 30; ear 23.

Skull: greatest length 35; condylo-incisive length 32·5; zygomatic breadth 19; nasals 14·5 × 5; intertemporal breadth 3·3; breadth of brain-case 15; height of crown from alveolus of m^3 10·6; palatilar length 16; palatal foramina 8·5; upper molar series 5.

Hab. as above.

Type. Adult male. B.M. no. 21. 11. 1. 22. Original number 1472. Collected 29th May, 1921.

Distinguishable by its size and comparatively dark colour.

"'Rata de los nogales.'—I call it this because it was only found where there are nogales (= walnuts).—Appears to be rare."—*E. B.*

7. *Phyllotis ricardulus*, Thos.

♂. 1407, 1412; ♀. 1415, 1420, 1424. Alfarcito, 2600 m.
♂. 1454. Sierra de Zenta, 4500 m.

8. *Euneomys* (*Auliscomys*) *leucurus*, Thos.

♀. 1428, 1443, 1445. Sierra de Zenta, 4500 m.

The type came from La Lagunita, Maimara, in the near neighbourhood of the present locality.

9. *Neotomys vulturnus*, sp. n.

♂. 1452; ♀. 1427, 1430, 1434, 1435. Sierra de Zenta, 4500 m.

Paler and with rather longer tail than *ebriosus*.

Size and general essential characters apparently quite as in *ebriosus*. Fur long and fine, ordinary hairs of back about 12 mm. in length, overlapped by fine long piles attaining 24 mm. General colour a fine grizzled mixture of grey and buffy, almost as in pale forms of *Sigmodon*, the fore back more grey, the rump becoming more and more buffy, and culminating in a rich ochraceous patch at the base of the tail. Sides greyer. Under surface slaty grey, finely washed with whitish. Chin and interramia white. Muzzle with a prominent patch of rich ochraceous. Ears brown, a few hairs on and around them buffy. Hands and feet with pale buffy metapodials and white digits. Tail longer than in *ebriosus*, brown above, buffy on sides, dull whitish below.

Skull apparently quite as in *ebriosus*.

Dimensions of the type:—

Head and body 155 mm.; tail 73; hind foot 22·5; ear 18.

Skull: greatest length 30; condylo-basal length 27·6; zygomatic breadth 17; nasals 12·2×6; interorbital breadth 3·1; palatilar length 12·6; palatal foramina 6·9; upper molar series 6.

Hab. as above. Two specimens were previously obtained by Sr. Budin at Lagunita, Maimara, 4300 m.

Type. Old female, B.M. no. 21. 11. 1. 34. Original number 1427. Collected 6th May, 1921.

The discovery of *Neotomys* in Jujuy is very unexpected, as its only known locality has hitherto been Central Peru, where Kalinowski got the type, a spirit-specimen, and P. O. Simons, shortly afterwards, obtained a skin. The Jujuy animal is remarkably like that of Peru, differing only in having a longer tail and a paler general colour, while the greyish fore back is less strongly distinguished from the buffy rump, and the under surface is a duller grey, less whitened on the sides of the belly, and without the dark brownish sternal band which is present on the skin sent by

Mr. Simons. Altogether the differences do not amount to very much; but, in view of the wide difference in locality, I consider it best for the present to distinguish *vulturnus* as species rather than subspecies.

The mammæ of *Neotomys*, which I was not able to record originally, are 2—2=8 in number.

"Not very abundant, and generally isolated from other rodents. More or less aquatic, living on the banks of streams and marshes, and one was caught among reeds on a little islet in a lake. Have their holes under isolated rocks on level ground, and are not found among the stony hills."—*E. B.*

10. *Akodon jucundus*, Thos.

♂. 1448; ♀. 1442. Sierra de Zenta, 4500 m.

11. *Akodon cænosus*, Thos.

♂. 1459, 1463, 1477, 1479, 1480, 1491, 1500, 1507: ♀. 1499, 1509.

"Lives in humid soil, making its holes at the roots of the trees."—*E. B.*

12. *Bolomys albiventer*, Thos.

♂. 1401; ♀. 1406. Alfarcito, 2600 m.

♂. 1433, 1437; ♀. 1440, 1447. Sierra de Zenta, 4500 m.

13. *Chræomys bacchante sodalis*, Thos.

♂. 1425, 1438; ♀. 1426, 1436, 1411. Sierra de Zenta, 4500 m.

The further series of this most beautiful Akodont bears out the distinction of *sodalis* from true Bolivian *bacchante* by the greater paleness of its general colour.

14. *Hypsimys deceptor*, sp. n.

♂. 1458, 1460, 1464, 1469, 1478, 1486, 1487, 1488, 1489, 1492; ♀. 1461, 1470, 1482, 1490, 1501. Higuerilla, 2000 m.

A species larger than *H. budini*, and strikingly like *Akodon sylvanus* externally.

Size considerably larger than in *H. budini*. General appearance almost precisely as in *Akodon sylvanus*. Fur fine and soft, hairs of back about 10 mm. in length. General colour above dark, finely grizzled olivaceous, rather lighter on sides. Under surface dull olivaceous grey, the hairs slaty basally, with buffy or dull whitish tips, a few hairs in the inguinal region more strongly buffy. Chin prominently white, the hairs white to the roots, this being the only external difference in colour from *A. sylvanus*.

Skull of the usual Akodont general shape, hardly so slender as in *H. budini*, and considerably larger than in the latter. Anterior edge of zygomatic plate decidedly slanted, much more so than in most Akodons, though, as it happens, some specimens of *A. sylvanus* have their plate more slanted than is normal in the genus. Palatal foramina large, well open, reaching nearly to the level of the middle of the large m^1. Bullæ rather large, decidedly larger than in *H. budini* or *A. sylvanus*.

Incisors fairly orthodont. Molars, as in *H. budini*, very hypsodont, much larger than in that species. Front of m^1 without trace of anterior central groove.

Dimensions of the type:—

Head and body 114 mm.; tail 86; hind foot 24; ear 16·5.

Skull: greatest length 30; condylo-incisive length 27·7; zygomatic breadth 15; nasals 11·3; interorbital breadth 4·6; breadth of brain-case 13·2; zygomatic plate 2·7; palatal foramina 7·3; upper molar series 5.

Hab. as above.

Type. Adult, but not old, male. B.M. no. 21. 11. 1. 66. Original number 1488. Collected 9th June, 1921.

This is a very interesting vole-mouse on account of its striking resemblance to a normal Akodon, and especially to *A. sylvanus*, which is found in Jujuy only some 100 km. to the east, and may very likely occur in the close neighbourhood of the present animal. Externally it is practically impossible to distinguish the two, except by the presence in the *Hypsimys* of a prominent white chin-spot—though even in the Akodon there is a slight lightening in this region.

The teeth, however, are distinctly those of *Hypsimys*, and confirm my distinction of the genus, while the slanting front edge of the zygomatic plate is a further character common to both species of *Hypsimys*. From *H. budini*, *H. deceptor* is readily distinguishable by its larger size and longer tooth-row.

"Dark Akodon, with a white chin, which I do not remember to have sent. Lives in holes, very open and visible, at the foot of the trees in thick damp woods."—*E. B.*

15. *Oxymycterus akodontius*, sp. n.

♂. 1465, 1515 (both slightly immature). Higuerilla, 2000′.

A dark-coloured species very like a large blackish Akodon.

Size about as in *O. paramensis.* General colour very dark, closely resembling that of some of the dark Akodonts, such as *Hypsimys deceptor*, though the colour is even blacker, less olivaceous. Back dark blackish brown, finely ticked with buffy, sides slightly lighter. Under surface dark slaty brown, washed with buffy, the buffy more prominent than on the upper surface, but far less than in most of the species of the present genus. Hands, feet, and tail blackish brown, darker than in Akodonts, the last-named organ comparatively short.

Skull very similar to that of *O. paramensis*, but the brain-case is larger and the muzzle more slender, with the supercilious upturn of the tip of the nose particularly well marked.

Dimensions of the type:—

Head and body 116 mm.; tail 79; hind foot 26; ear 18·5.

Skull: greatest length 31; condylo-incisive length 27; zygomatic breadth 13·5; nasals 11·2 × 33; interorbital breadth 6; breadth of brain-case 13·7; palatal foramina 6·2; upper molar series 5.

Hab. as above.

Type. Young adult male (teeth in position, but unworn). B.M. no. 21. 11. 1. 72. Original number 1465. Collected 8th May, 1921.

This Hocicudo is quite without the rufous or ochraceous coloration of most species of *Oxymycterus*, being a dark finely grizzled blackish, as in many of the dark-coloured Akodont forms.

"I caught five specimens of this Hocicudo, but could only save two, as the others were eaten by rats and their skulls totally destroyed. When rats attack a dead specimen they always commence by eating the brain. One of these specimens was caught in a Tuco-tuco hole. I have observed both these animals dig their holes like the *Yeoxus* of the south, making small hillocks of earth over them. The burrows are round and clearly visible. Hocicudos live in humid places among the hills, in the thickest parts of the woods.

"These specimens appear to be less rufous than those I obtained at Leon, Jujuy, and are probably a different species." [The Leon *Oxymycterus* was recorded as *O. paramensis.*]—*E. B.*

16. *Octodontomys gliroides*, d'Orb.

♂. 1403, 1408, 1419 ; ♀. 1402, 1404, 1422. Alfarcito, 2600 m.

17. *Abrocoma cinerea*, Thos.

♂. 1431, 1450. Sierra de Zenta, 4500 m.

This, the first of the Argentine species of *Abrocoma* to be discovered, was previously only known from the type-specimen, obtained by Sr. Budin in 1919 at Casabindo, about 100 km. to the west.

"Lives among the rocky volcanic mountains; is very difficult to capture, as other rodents constantly spring the traps set for it, and all efforts to obtain further examples were without result."—*E. B.*

18. *Ctenomys budini*, Thos.

♂. 1451, 1456 ; ♀. 1453. Sierra de Zenta, 4500 m.

♂. 1457, 1467 ; ♀. 1456, 1475, 1493, 1503, 1508. Higuerilla, 2000 m.

"I hope that in these Tuco-tucos you will find a new subspecies, as it seems to me impossible that the same form should occur on the bare sandy heights of the Sierra de Zenta and the low damp vegetable soil on which those of Higuerilla were found."—*E. B.*

But the original *budini* was found at the same altitude as the Sierra de Zenta specimens, so that the latter are no doubt typical *budini*. Those from Higuerilla are a shade darker in colour, as is natural, and appear to approximate more to the low country woodland forms *sylvanus* and *utibilis*.

19. *Lagidium tucumanum*, Thos.

♀. 1405 (immature). Alfarcito, 2600 m.

Quite of the greyish colour of the Maimara specimens, not yellow as in *L. vulcani* from Casabindo.

20. *Galea comes*, Thos.

♂. 1416, 1423; ♀. 1413, 1418, 1421. Alfarcito, 2600 m.

♂. 1444 ; ♀. 1436, 1439, 1449. Sierra de Zenta, 4500 m.

"In stony places."—*E. B.*

21. *Marmosa elegans sponsoria*, Thos.

♂. 1468, 1473, 1484, 1497; ♀. 1481, 1505. Higuerilla, 2000 m.

I am inclined to suppose that *sponsoria* should not have been separated from *cinderella*, but will not definitely suppress the name until a better series is available from Tucuman, the typo-locality of the latter.

22. *Marmosa elegans pallidior*, Thos.

♀. 1409 (imm.). Alfarcito, 2600 m.

LXI.—*The Masked Civets* (Paguma) *of Western China*.
By OLDFIELD THOMAS.

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THE British Museum has received two examples of *Paguma* from Yunnan, collected by the Rev. W. N. Fergusson, and these I find to be nearly allied to the form from Burma and the Shan States, described by Wroughton as *Paguma larvata intrudens* [*].

This latter is an animal larger than the South and Eastern China *P. larvata*, but I find that two specimens from Western China (Sui-ling, Chung-king, and Ichang) are also of the same comparatively large size, as is that from Yunnan, so that it is evident that the Pagumas of the Upper Yang-tze and of the Shan States are all consistently larger than true *P. larvata*.

Inter se, however, these large Pagumas seem divisible into three races, which might be treated as subspecies, as follows:—

1. *P. l. intrudens*, Wroughton.

General colour duller, browner. Suborbital white patch large. White of nape at a maximum, passing down to or past the withers. Tail black terminally for about 16 inches.

Hab. Burma and Shan States.

2. *P. l. yunalis*, subsp. n.

General colour brighter, warmer, the ends of the hairs almost ochraceous. Suborbital patch small, a mere vague streak. White of nape barely reaching withers, well defined, more or less surrounded by black. Distal foot of tail black. Skull 120 mm. from occipital crest to gnathion.

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[*] Journ. Bombay N. H. Soc. xix. p. 793 (1910).

Hab. Yunnan. Type from Yen-yuen-sien.

Type. Adult female. B.M. no. 21.10.15.1. Collected by the Rev. W. N. Ferguson.

3. *P. l. rivalis*, subsp. n.

General colour pale, the ends of the hairs buffy or buffy whitish. Suborbital patch large, prominently white, extending practically up to the eye. Nape-patch irregular, whitish, not surrounded by black, and not extending to the withers. End of tail (about 8 inches in the Chung-king specimen) above black.

Hab. Yang-tze from Chung-king to Ichang; type from Ichang.

Type. Adult female. B.M. no. 2.6 10.16. Presented by F. W. Styan, Esq.

It is probable that these large western Pagumas should be specifically separated from the smaller ones of Eastern and Southern China, but owing to the absence of good skulls I prefer to leave this question open for the present, and treat them all as subspecies of *P. larvata*.

I am not in a position to check Prof. Matschie's distinction[*] of the Canton form as *P. reevesi*, but I may note that Reeves's specimen, the type of the latter name, is still in the British Museum, No. 81 *a*.

LXII.—*On Three new Australian Rats.*

By Oldfield Thomas.

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Arising out of the recent gift to the British Museum by Prof. Wood Jones of some South-Australian Muridæ, I have had occasion to look at several of our Australian rats, and now find the three following forms to need description:—

Leporillus jonesi, sp. n.

Near *L. apicalis*, but larger and with shorter ears.

Size, as gauged by skull and foot, decidedly larger than in

[*] Filchner Exped., Mamm. p. 183 (1907).

apicalis. Fur rather thin and poor, not so thick and woolly as in *apicalis*, hairs of back about 17 mm. in length. General colour above dull brown (not far from "Saccardo's umber"), the withers tending more towards buffy. Under surface slaty grey broadly washed with drabby whitish, the sides of the belly more strongly drabby. Ears shorter than in *apicalis*, dark brown. Hands with the metatarsals dark brown, the digits lighter. Feet with the ankles, outer side of the metatarsals (inner in made-up skin), and proximal part of the digits brown, the inner portion of the metatarsals, and the tips of the digits white. Tail well haired but not tufted, brown above, dull whitish below, throughout its length. Not whitened at tip, as is also the case with *apicalis*, the original description notwithstanding.

Skull larger and stouter than in *apicalis*. Muzzle broad and heavy. Interorbital region broad, with comparatively sharp-angled edges. Zygomatic plate more projected forwards. Palatal foramina shorter, not reaching the level of m^1. Bullæ rather large—these organs not present in the available specimens of *apicalis*.

Incisors rather slender, not thicker than in *apicalis*, but meeting each other at a wider angle, owing to the greater breadth of the muzzle. Molars larger than in *apicalis*, but apparently of similar structure—much worn down in the type.

Dimensions of the type (measured on the skin):—

Head and body 195 mm.; tail 178 (not quite perfect); hind foot 48; ear (dry) 24.

Skull: greatest length 48; condylo-incisive length 46; zygomatic breadth 23·5; nasals 18 × 6; interorbital breadth 5·7; breadth of brain-case 18·5; zygomatic plate 6; palatilar length 13·6; palatal foramina 8·8 × 3·8; bulla 7·8; upper molar series 9·3.

Hab. Franklin's Island, Nuyts Archipelago, S. Australia.

Type. Old female. B.M. no. 21. 7. 3. 2. Collected 23rd November, 1920, and presented by Professor F. Wood Jones. An immature specimen also examined.

This fine rat forms a very interesting discovery, as it represents a second species of the rare genus *Leporillus*, hitherto only known by the two examples of *L. apicalis* in the British Museum, the latter species being in all probability killed out on the mainland, and I have great pleasure in connecting with it the name of its captor and donor, Prof. Wood Jones, to whom also we owe the modern specimen of *Rattus greyi* recently referred to in a previous paper.

Although Gould had in his collection two specimens of

L. apicalis, both of which we now have, he seems only to have done his describing from one of them (B.M. no. 53. 10. 22. 14)—the worst of the two, young, and with an imperfect tail. Probably from memory, and certainly wrongly, he stated that the species had a white-tipped tail, but his overlooked second specimen—adult, with nearly perfect skull and quite perfect tail (B.M. no. 53. 10. 22. 14)—has the latter organ uniformly blackish or brownish above and dull white below, and there is no indication of the white tail-tip found in so many Australasian Muridæ.

When first making the genus *Leporillus*, I assigned "*Hapalotis*" *murinus* to it as a second species, but have since come to the conclusion that that animal should be referred to *Pseudomys*, in which genus it is probably synonymous with *Ps. australis*.

The Long-haired Rat of Central Australia.

In his 'List of Mammals in the British Museum' (1843) Gray cited two rats from the Liverpool Plains, New South Wales, under the name of *Pseudomys greyi*—a name, however, which is doubly invalid, being a *nomen nudum* and there having been already a *Mus* (=*Rattus*) *greyi* in existence.

These specimens I formerly assigned to Gould's *Mus longipilis* (=*villosissimus*, Waite), a species stated to have been collected on the "Expedition to the Victoria River." As may be gathered from the Diary of the Expedition *, the Victoria River was the same as the Barcoo, or Cooper's Creek, which runs into Lake Eyre, Central Australia. It is therefore in very much the same region as that in which Mr. Waite's specimens were obtained, and is in the same faunal area as Alexandria Station, Northern Territory, where our large series of *villosissimus* was captured by Mr. Stalker †.

Compared with these latter, the Liverpool Plains examples, in spite of their considerable geographical distance, prove to be so similar that I should consider them as being of the same species, but would propose subspecific distinction for them:—

Rattus villosissimus profusus, subsp. n.

Size rather less than in average *villosissimus*. Fur excessively long, even longer than in *villosissimus*, and much thicker and softer, quite different from the comparatively harsh coat of that animal; the ordinary hairs over 22 mm. in length, and the longer piles attaining over 50 mm. General colour browner and more strongly buffy than in the comparatively greyish *villosissimus*; hairs of under surface slaty at base, broadly washed terminally with yellowish white.

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* J. Geog. Soc. xxii. p. 228 *et seqq.* (1852).

† P. Z. S. 1906, p. 537.

Tail more thickly hairy, the scales almost hidden by the hairs.

Skull as in *villosissimus*.

Dimensions of the type:—

Head and body (skin) 185 mm.; tail —; hind foot 33.

Skull: tip of nasals to back of interparietal 38·4; nasals 15; interorbital breadth 4·8; breadth across parietal ridges 13; palatal foramina 8·4; upper molar series 7·5.

Hab. Liverpool Plains, New South Wales.

Type. Adult male. B.M. no. 41. 1262. Gould Collection. Three specimens originally, but one given away in exchange in 1858.

R. villosissimus is a native of the hot central region of Australia, while this much thicker-coated form represents (or used to represent) the species in the colder highlands of New South Wales.

It is to be noted, however, that the Victoria River Expedition actually passed through the Liverpool Plains on the way to that River, and I have therefore thought it wise to consult the authorities of the Sydney Museum as to the characters of Gould's type. In answer, Mr. Troughton has been good enough to give me such particulars about that animal that there can be no doubt that it really was the Central Australian and not the Liverpool Plains form which Gould described and Waite renamed.

In size of skull *R. villosissimus* is one of the most variable species known to me, for in the fine series obtained at Alexandria examples, all fully adult, are to be found ranging from 36 to 44 mm. in total length—a variation only equalled in *R. norvegicus*. The bullæ also vary greatly—from 7·5 to 9·2 mm. in length,—but, on the whole, it is an animal with comparatively large bullæ. It is unfortunate that the bullæ have not been preserved in the specimens of *profusus*, but, being a native of a less desert area, it would probably have had smaller bullæ.

Pseudomys australis oralis, sp. n.

Closely allied to true *australis*, but rather larger, with longer softer hair. Colour of the same dark grey above, lower surface washed with yellowish white, without the brown tone usually found in *australis*. Ears short, as in *australis*, not as in *auritus*.

Skull longer than in *australis*, the interorbital region longer and narrower, and more sharply square-edged. Palatal foramina proportionally shorter, not or scarcely penetrating between the molars, while in *australis* they reach to the level of the middle of m^1. Teeth averaging larger, though there is some variation in this respect.

Dimensions of the type (measured on skin) :—

Head and body (no doubt stretched) 165 mm.; tail 139; hind foot (wet) 32; ear (wet) 20.

Skull: tip of nasals to back of interparietal 34; condylo-incisive length 31·5; zygomatic breadth 17·7; nasals 14; interorbital breadth 3·6; breadth of brain-case 16; palatal foramina 7·5; upper molar series 6·7.

Hab. Coast region of New South Wales. A specimen in Liverpool Museum from the Hastings River (Gould Coll.).

Type. Young adult. B.M. no. 47. 1. 20. 2. Purchased of Pamplin.

The rats variously termed *Pseudomys*, *Mus*, or *Hapalotis australis*, *murinus*, and *lineolatus* I believe to be all one species, and they certainly all come from one region—namely, that of the Darling Downs and Liverpool Plains, on the western side of the great dividing range. The present form, on the other hand, as shown by a specimen (no. 409) in the Liverpool Museum, occurs, or, at least, used to occur, on the coast to the east of the range, that individual having been collected on the Hastings River. The type, in the British Museum, is quite like the Liverpool specimen in the peculiar lengthening of the middle part of the skull and the comparatively short palatal foramina, the two specimens apparently representing a definable geographical race.

LXIII.—*New* Hesperomys *and* Galea *from Bolivia*.

By Oldfield Thomas.

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The British Museum owes to the generosity of the Marquis de Wavrin a further small collection of mammals obtained during his S.-American expedition—this time from the Parapiti region of Eastern Bolivia, south of Santa Cruz de la Sierra. With the exception of the mammals obtained by

Mr. Bridges at Santa Cruz some seventy-five years ago, and a few odd specimens collected by Herr Steinbach, almost no collections have been made in this area, so that all those sent by the Marquis de Wavrin are very acceptable, and the occurrence of these two new ones was quite to be expected.

Hesperomys muriculus, sp. n.

A comparatively large dark species, rather like *Mus musculus*.

General size about as in *H. musculinus*. General colour dark mouse-grey, the tips of the hairs inconspicuously buffy. Under surface soiled greyish, the hairs slaty at base and washed terminally with dull whitish, far less white than in other species. Proectote of ears blackish, with buffy edges, metentote buffy brown; no white ear-patch. Hands and feet grey. Tail about as long as the body without the head, dark grey above, rather lighter below. Number of mammæ not known.

Skull of the usual shape, the adult with very well-developed supraorbital ledges.

Dimensions of the type (measured in the flesh):—

Head and body 89 mm.; tail 69; hind foot 20; ear 16.

Skull: greatest length 25·3; condylo-incisive length 24; zygomatic breadth 13·2; nasals 10, interorbital breadth 4·2; breadth of brain-case on ridges 10; palatilar length 10·3; palatal foramina 6; upper molar series 4·1.

Hab. S.E. Bolivian lowlands. Type from San Antonio, Parapiti, on 20° S., about 250 km. south of Santa Cruz de la Sierra. Alt. 600 m.

Type. Adult male. B.M. no. 21. 11. 6. 12. Original number 75. Collected 7th February, 1921, and presented by the Marquis de Wavrin.

This very distinct little species, found in company with, and almost mistakeable for, *Mus musculus*, is represented in the Marquis de Wavrin's collection by four skins and two extra skulls. The species is readily recognizable by its comparatively dark colour.

"Trapped in a house surrounded by bush."—*W.*

Galea boliviensis demissa, subsp. n.

General essential characters as in true *boliviensis* of the high Andean plateau, but the skull with certain differences in detail.

Skin no doubt as usual, but no specimen has been sent.

Skull longer and proportionally narrower than in *boliviensis*, the zygomata less boldly thrown out, especially anteriorly. Upper outline less strongly bowed. Muzzle longer, the nasals longer and more parallel-sided, less contracted in front and behind. Interorbital region with its edges more openly concave, the strong back-to-back concavities of the orbital edges far less abruptly contrasted. Brain-case narrower. Choanæ deeply and sharply V-shaped, instead of being more or less irregularly rounded. Bullæ as in *boliviensis*.

Incisors rather less strongly bevelled off laterally, this resulting in a different curvature of the cutting-edge.

Dimensions of the type (those of the animal recorded by the collector on the label of the skull):—

Head and body 232 mm.; hind foot 36; ear 21.

Skull: median upper length 53·3; condylo-incisive length 49; zygomatic breadth 31·2; nasals 18·3 × 7·3; interorbital breadth 12; breadth of brain-case 20·7; palatilar length 23·5; length of bulla 12·5; upper molar series (crowns) 11·7.

Hab. Lowlands of S.E. Bolivia. Type from San Antonio, Parapiti, Bolivia. Alt. 600 m.

Type. Adult skull (female). B.M. no. 21. 11. 6. 20. Original number 64. Collected 18th January, 1921, and presented by the Marquis de Wavrin. A younger skull also examined.

Believing it to be a common and well-known animal, the Marquis did not send a skin of this cavy, but its skull shows, as might be expected, sufficient differences from that of the true *Galea boliviensis* of the high Bolivian plateau (altitude 3000 to 4000 m.) to indicate that the lowland form is different subspecifically. The skull-differences are very similar in type to those which I found in the genus *Caviella* to characterize the different subspecies of *C. australis*.

LXIV.—*Some Emendations to their Recent Paper "On* Helicella, *Férussac*." By G. K. GUDE, F.Z.S., and B. B. WOODWARD, F.L.S.

It has been pointed out to us that some regrettable oversights occur in our paper "On *Helicella*, Férussac" (Proc. Malac. Soc. xiv., Oct. 1921, pp. 174–190), which it is desirable to rectify without loss of time.

In the multitude of changes and rearrangements entailed in preparing the paper it was not observed that under the

"Subgenus *Capillifera*, Honigmann, 1906" (p. 179) there had been included (p. 180) "Section 4: *Perforatella*, Schlüter, 1838." The latter will, therefore, become the name for the subgenus, *Capillifera* being reserved, as before, for section 1. Similarly, the "Subgenus *Jacosta*, Gray, 1821" (p. 183) and "Genus *Helicopsis*, Fitzinger, 1833" (p. 181) must exchange rank.

Monachella, proposed by us (p. 179) in lieu of *Monacha*, proves to be preoccupied for Aves (Salvadori, Ann. Mus. Civ. Genova, vi. 1874, p. 82). We now propose to substitute for it *Monachoïdes*.

Trochoidea, Brown, 1827, was referred to by us in a note (p. 183), when pointing out that it had been improperly employed for *Helix elegans*, Gmelin, under the erroneous belief that that species was a synonym for the *Trochus terrestris* of Pennant. The latter, however, was undoubtedly the same species as the *Helix fulva* of Müller. It has, therefore, been suggested to us that Brown's *Trochoidea* should have appeared in the synonymy under *Petasina*, Beck, 1817 (p. 177). We think it should not, as will become apparent from the following succinct history of the name:—

Pennant, in 1777 (Brit. Zool. iv. 8vo ed. p. 127, fig. 108), described and figured under the name of *Trochus terrestris* a shell that was undoubtedly the *Helix fulva* of Muller. Da Costa, 1778 (Hist. Nat. Test. Brit. p. 35), described but did not figure a "*Trochus terrestris*, Listeri," which is also obviously the *H. fulva*, Müll. Lister, of course, gave no such name, but his "Buccinum parvum, sive trochilus sylvaticus," &c., is evidently the same thing. Montagu, in 1803, introduced confusion into the case. On the one hand (Test. Brit. p. 287), he gave *Trochus terrestris*, citing Pennant as above and also Lister's (Hist. Conch.) t. 61. fig. 58, which is clearly the *H. elegans* of Gmelin. On the other hand (*op. cit.* p. 427. pl. xi. fig. 9), he created *Helix trochiformis*, under which he cited Da Costa's "*Trochus terrestris*, Listeri," and reference to Lister's "Hist. Anim. Angl.," adding *Helix trochulus*, Müller, which, however, is now held to be the young form of *Ena obscura*. Brown, in 1827, followed in Montagu's footsteps, for he has (Illust. Conch. Gt. Brit. pl. xl. fig. 2) the *Helix trochiformis*, Mont., which is manifestly Müller's *fulva*, and also his own *Trochoidea terrestre* (*op. cit.* pl. xli. figs. 80 & 81), cited as of Montagu (not as of Pennant direct), whilst his accompanying figures are evidently inventions, for they were not taken either from Pennant or from Lister's "Hist. Conch.," nor do they resemble either *fulva* or *elegans*. In the second edition of his work Brown (p. 46, pl. xvii. fig. 2) changed the name of the former to *H. fulva*, whilst no allusion to the latter appeared in the text; but in the explanation of the plate, now renumbered xiv., figures 80 and 81 are called *Helix fulva*. Brown had, therefore, seen and recanted his error, but to avoid spoiling his plate refrained from erasing the figures 80 and 81.

Despite the yet further complication introduced by Gray in 1847 (Proc. Zool. Soc. p. 173) when he made "*Trochidea* [sic], Brown, 1827," a subgenus of *Theba*, and cited as type "*Helix elegans*," we consider that Brown's *Trochoidea* cannot be taken to refer definitely to either *H. fulva* or *H. elegans*, and should be allowed to disappear from molluscan literature.

LXV.—*Preliminary Account of supposed new Genus and Species.* By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S.

Problemacaris spinetum, gen. et sp. n.

Though preliminary descriptions are, as a rule, objectionable, the present instance is justified by the fact that the full account, with the illustrations already prepared, cannot hope for early publication.

For the genus, it may be said that it belongs to the Carides in Borradaile's 'Classification of the Decapod Crustacea,' 1907, without exactly fitting any of his subdivisions. It appears to be an oversight in the Classification that the Pandaloida have the wrist of the second legs "divided into two or more joints," while the "Thalassocarinæ," a subfamily of the Pandalidæ, have the "second wrists undivided." Borradaile's further 'Notes on Carides' in 1915 do not allude to this ambiguity, nor is it explained in the additional notes (Tr. Linn. Soc. vol. xvii. 1917).

The name adopted for the new genus refers to the obscurity of its place in classification, and the specific name alludes to the multiplicity of conspicuous spines in many parts of the organism. The palpless mandibles have the cutting-edge, spine-row, and a molar-edge in a continuous line. Flagellate exopods are present on all appendages from first maxillipeds to at least the fourth peræopods. Third maxillipeds slenderly pediform. First and second peræopods with small chelæ and undivided wrist.

This form, while evidently distinct, superficially invites comparison with *Thalassocaris stimpsoni*, Bate ('Challenger' Macrura, pl. cxvii.), noted by Balss as a larval form of some unknown genus. Suggestions as to these obscurities will be welcome.

LXVI.—*Two new Species of Slow-Loris.*
By OLDFIELD THOMAS.

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Nycticebus incanus, sp. n.

A uniformly ashy-grey species.

Size comparatively large, approaching that of *N. bengalensis* and *cinereus*. General colour uniform grey (a little darker than "pale ventral grey"), the body not contrasted brown or rufous as compared with the head. It is true that the head is lighter—whitish grey,—but it is not strongly contrasted with the colour of the body. On the posterior back and rump there is a little brownish, but scarcely affecting the general colour. Sides and under surface uniformly grey. Median rufous-brown line well-marked, commencing on the occiput and running down to the rump. Face white. Eye-rings brown. Ears reddish brown. Arms and legs grey like body; hands and feet dull white.

Skull of the comparatively large size found in *N. bengalensis* and *cinereus*, but the zygomata not so widely spread. Sagittal crests, in an old female, not meeting on the crown. Postorbital bar broad. Teeth about as in *cinereus*, smaller than in *bengalensis*. Four upper incisors.

Dimensions of the type (measured on skin):—

Head and body 335 mm.; hind foot (wet) 70.

Skull: greatest length 67; zygomatic breadth 43·5; breadth of postorbital bar 4·7; breadth between coronal ridges 5; mastoid breadth 37·7; palatal length 25·3; front of canine to back of m^3 24.

Hab. Lower Pegu. Type from Kyeikpadein.

Type. Old female. B.M. no. 81. 12. 2. 1. Collected 27th August, 1879. Presented by E. W. Oates, Esq. One specimen.

This animal is probably most nearly allied to *N. cinereus*, the Siamese Slow-Loris, but differs by the absence of the brown coloration on the back and sides, the whole animal being a comparatively uniform grey, apart from the usual dorsal stripe.

Nycticebus ornatus, sp. n.

A rather small species, with strongly contrasted head-markings.

Fur very long, soft and fine, far softer and finer than in *N. coucang*. General colour greyish washed with dark buffy. Dorsal stripe blackish, continued forwards on to the crown, where it meets four blackish lines which rise from in front of the ears, and from the black orbital rings on each side, the spaces between these lines contrasted whitish. Temporal area and sides of neck prominently whitish, in marked contrast to the black mesial band. Hands and feet dull buffy whitish.

Skull rather small. Upper incisors two.

Dimensions of the type (measured in the flesh):—

Head and body 290 mm.; hind foot 72; ear 23.

Skull: greatest length 58; zygomatic breadth 38; front of canine to back of m^3 21.

Hab. W. Java. Type from Batavia.

Type. Female with basilar suture not quite closed. B.M. no. 9. 1. 5. 34. Original number 1371. Collected 21st February, 1908, by G. C. Shortridge. Presented by W. E. Balston, Esq. One specimen from the type-locality, and another, very similar, said to be from "Sumatra," coll. Raffles, but this cannot be implicity trusted.

This is, no doubt, the animal considered as *javanicus* by Stone and Rehn and by Lyon in their respective papers on the genus, and also the "variety C" of Blyth. But it would seem not to be the real *javanicus* of Geoffroy, whose description is evidently based on one of the ordinary Malayan forms without contrasted head-markings, which it is impossible to believe that author would have omitted to mention. Moreover, there is in the Museum one of Horsfield's Java specimens which does agree with Geoffroy's description, and this I consider to be the real *javanicus*. This Horsfield specimen is a uniform reddish brown, with inconspicuous face-markings and a brown dorsal stripe—in fact, very like specimens of *malaianus*,—and thus agrees precisely with the description of *javanicus*. Whether it really came from Java I cannot be certain, but the island is quite large enough to contain two different forms of the genus.

Furthermore, I believe this Horsfield specimen of *javanicus* represents the true original *coucang*, Bodd., which, as shown elsewhere (J. Bombay Soc. Nat. Hist.), is certainly not the Bengal and Assam form, as commonly asserted, but one of the Malayan species. *N. javanicus* should therefore be considered as a synonym of *N. coucang*.

LXVII.—*H. Sauter's Formosan Collections*: Culicidæ.

By F. W. Edwards.

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During the past summer I received for identification from Dr. Walther Horn (Berlin-Dahlem) a number of Formosan mosquitoes collected by Herr H. Sautor. The chief interest of the collection lay in two new species of *Megarhinus* (subgenus *Toxorhynchites*) which it contained, and which are described below. Since little has been recorded concerning the mosquitoes of Formosa, a list is given of the other species contained in the collection. Additional specimens collected by Herr Sauter were subsequently received from the Budapest Museum through Mr. F. V. Theobald; the records of these are included in the list, and are distinguished by an asterisk:—

Anopheles (*Anopheles*) *hyrcanus* (Pall.).—Toyen, Macuyama, Anping, *Takao. Range of variation considerable, but all of the typical Chinese form (rather light-coloured body, narrow tarsal rings, fringe-spot usually present, palpal rings moderately distinct).

Anopheles (*Myzomyia*) *subpictus*, Grassi.—*Takao.

Armigeres (*Armigeres*) *obturbans* (Walk.).—Taihoku, Chosokei, Macuyama, *Tainan.

Armigeres (*Leicesteria*) *annulitarsis*, Leic.—Macuyama, Kankau.

Aëdes (*Stegomyia*) *argenteus* (Poiret) (*S. fasciata*, F.).—Anping, *Takao.

Aëdes (*Stegomyia*) *albopictus* (Skuse).—Macuyama, Hokuto, Taihoku.

Aëdes (? *Skusea*) *amesi* (Ludl.).—*Takao, 1 ♀.

Aëdes (*Ecculex*) *vexans* (Mg.).—*Takao, 1 ♂.

Tæniorhynchus (*Mansonioides*) *uniformis*, Theo.—Taihoku, Hokuto, *Takao.

Lutzia concolor (Theo.).—Macuyama.

Culex mimeticus, Noé, var.—Macuyama. No basal arm to tenth sternites; last joint of male palpi with the tip rather more broadly pale than in the European form. Specimens of this variety are in the British Museum from Formosa (*Shiraki*), Hong Kong (*Macfarlane*), and India (*Howlett*, *Fletcher*).

Culex whitmorei (Giles).—Toyen district, Sanshikyaku.

Culex bitæniorhynchus, Giles.—Macuyama, Daitotei, Chosokei, Sanshikyaku.

Culex sitiens, Wied.—*Takao.
Culex vishnui, Theo.—Taihoku, Daitotei.
Culex tritæniorhynchus, Giles.—Macuyama, Daitotei, Sanshikyaku, *Takao.
Culex fatigans, Wied.—A large number.
Culex fuscocephalus, Theo.—Hokuto, Sanshikyaku.
Culex (*Lophoceratomyia*) *rubithoracis*, Leic.—Taihoku.
Rachionotomyia sp. (? *bambusa*, Yam.).—*Polisha.

Megarhinus manicatus, sp. n.

♀. *Head* clothed mostly with dark bronze-coloured scales; a silvery-white rim round the eyes. Proboscis and palpi with purple scales, the latter slender, reaching to the base of the fifth flagellar joint. Torus black, with white pollinosity. First flagellar joint without scales. *Thorax*: prothoracic lobes with greyish-silvery scales only. Proepimera for the most part silvery-scaled, but some purple scales on the upper part. Mesonotum rubbed, the remaining scales nearly all metallic green, except on the scutellum, where they are coppery golden. Pleuræ largely covered with silvery scales, with a slight golden tinge in some lights. *Abdomen* clothed with bluish-purple scales above; sides of the first tergite and small lateral basal patches on the succeeding tergites shining white. No lateral scale-tufts, but the eighth segment with rather long and dense terminal golden bristles. Venter mostly golden; sternites 4 and 7 almost entirely purple, the remaining sternites with a narrow median purple stripe. *Legs* purple-scaled; femora golden beneath almost to the tips; front and mid tibiæ with indications of a golden stripe on the outer or hinder side. All the tarsi with a broad creamy-white ring, which on the front and mid legs includes the tip of the second joint, the whole of the third and fourth, and the base of the fifth, but on the hind legs includes only the fourth joint and the extreme tip of the third; in addition, the first tarsal joint of the middle and hind legs has a distinct though rather narrow creamy-white ring; fifth tarsal joint on all legs mostly blackish. *Wings* with brownish membrane and a distinctly darker brown cloud over the cross-veins. Wing-scales small and thinly spread, wings therefore appearing almost bare. Longitudinal portion of the bent r–m cross-vein of the same length as the vertical portion; the m–cu cross-vein slightly external to the vertical portion of r–m. Stem of halteres orange; knob dark, clothed with golden scales. Wing-length 7·5 mm.

FORMOSA: Toa Tsui Kutsu, v. 1914 (*H. Sauter*).

Megarhinus aurifluus, sp. n.

♂. *Head*: scales mostly greenish; a paler rim round the eyes. Proboscis dark blue on the stout portion, more coppery on the slender portion. Palpi distinctly four-jointed, the first joint the shortest; fourth joint scarcely half as long again as the third; scales dark blue, a narrow creamy ring at the tip of the first joint and a second just before the tip of the second joint. Antennæ only moderately stout, the joints distinctly swollen in the middle; torus clothed with small white scales; second joint with a few dark green scales, less than twice as long as the third. *Thorax*: prothoracic lobes, proepimera, and sides of mesonotum with light metallic-green scales (middle of mesonotum rubbed). Pleuræ with light golden scales. *Abdomen* clothed above with metallic-green scales towards the base, the colour shading through blue to violet at the tip; a lateral pale golden stripe which broadens out somewhat in the middle of each segment, and on the fifth in one specimen forms an almost complete but narrow transverse band. Sixth segment laterally with some golden hairs on the basal half, apical half with dense black hair-like scales; seventh and eighth segments laterally with long, dense, golden, hair-like scales. Venter almost entirely blue, the fifth and sixth sternites with lateral golden patches, which are broadest on the posterior margin and do not quite reach the base. *Legs* dark blue; hind femora light golden towards the base, except dorsally; middle tibiæ more or less conspicuously golden on a considerable area a little beyond the middle, the same coloration being slightly indicated in the hind tibiæ of one specimen. Front tarsi with a white ring embracing the apical third of the first and the whole of the second joint; mid-tarsi with a white ring at the base of the first joint, the whole of joints 2–4 white; hind tarsi with one rather narrow whitish ring situated at the base of the second joint. *Wings* with most of the veins dark-bordered, especially those towards the costa; scales fairly conspicuous on costa, subcosta, and radial veins. Longitudinal portion of r–m quite twice as long as the vertical portion; m–cu variable in position. Wing-length 8–12 mm.

♀. Palpi slender, purple-scaled, reaching to base of fifth flagellar joint. First flagellar joint with a few golden scales towards the base. Yellowish transverse band on fifth abdominal tergite complete. Venter much rubbed, but evidently much more extensively yellow than in the male. Front legs with the femora pale golden posteriorly, the white ring embracing more than half of the first tarsal joint. Mid-legs missing. Hind legs with the tibiæ conspicuously golden beneath beyond the middle; first tarsal joint pale golden beneath and at the sides on the basal third, second tarsal joint with a white ring as in the male. Wing-length 8 mm.

Formosa: Toa Tsui Kutsu, v. 1914, 1 ♀; Kankau, 1912, 2 ♂; and Toyenmongai, 1 ♂ (*H. Sauter*); also 1 ♂ without definite data. Co-types in the Berlin-Dahlem Museum, the Budapest Museum, and the British Museum.

This is apparently the species which Theobald described as *M. splendens*, Wied., in 1901. Although I have not seen the specimen on which this description is based, it is evident that the determination was erroneous, since Wiedemann states that the tufts of the seventh abdominal segment in his species are blackish. Through the kindness of Dr. H. Zerny, of the Vienna Museum, I have recently been able to examine Wiedemann's type ♂ of *M. splendens*. It proves to be identical with *M. regius* (Tennent), as might be supposed from the description.

LXVIII.—*The Cichlid Fishes of Lakes Albert Edward and Kivu.* By C. Tate Regan, M.A., F.R.S.

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Only two or three species of Cichlidæ are known from Lake Albert, and these have also been found in the Bahr-el-Gebel. Lakes Albert Edward and Kivu appear to have a more interesting Cichlid fauna, each possessing a number of peculiar forms of *Haplochromis*, which appear to be more nearly related to species found in Lake Victoria than to those of the Nile.

Synopsis of the Genera.

I. Scales cycloid; pharyngeal apophysis formed by parasphenoid alone. 1. *Tilapia*.

II. Scales more or less distinctly ctenoid; pharyngeal apophysis formed by parasphenoid in middle and basioccipital at sides.

Teeth conical, or outer bicuspid and inner tricuspid. 2. *Haplochromis*.

An outer close-set series of enlarged teeth, with strongly incurved, flattened, rounded crowns, followed by 2 series of minute tricuspid teeth . . 3. *Schubotzia*.

1. TILAPIA, A. Smith, 1840.

Scales cycloid. Teeth in several series, the outer usually bicuspid, the inner tricuspid.

Africa and Syria.

1. *Tilapia nilotica*, Linn.

Bouleng. Cat. Afr. Fish. iii. p. 162, fig. 106.

This species extends from the Nile through Lakes Albert, Albert Edward, and Kivu to Tanganyika.

2. *Tilapia eduardiana*, Bouleng., 1912.

Bouleng. Cat. Afr. Fish iii. p. 166, fig. 107.

Lake Albert Edward watershed of Mount Ruwenzori and Lake Gangu.

Closely related to *T. variabilis* of Lake Victoria.

2. HAPLOCHROMIS, Hilgendorf, 1888.

Scales ctenoid. Teeth in 2 or more series, conical, or outer bicuspid and inner tricuspid.

Africa and Syria.

Synopsis of the Species.

I. Albert Edward species.
  A. Jaws equal or lower feebly projecting.
    1. 7 to 9 gill-rakers on lower part of anterior arch. 1. *schubotzi.*
    2. 9 to 12 gill-rakers on lower part of anterior arch.
Eye 3⅓ in head (in specimens of 80 to 90 mm.); maxillary not reaching eye .... 2. *pappenheimi.*
Eye 3 in head (in a specimen of 80 mm.); scales on chest very small, 8 between pectoral and pelvic fins............................ 3. *eduardii.*
Eye 2¾ in head (in a specimen of 80 mm.); scales on chest moderate, 4 between pectoral and pelvic fins............................ 4. *nigripinnis.*
  B. Lower jaw distinctly projecting........ 5. *squamipinnis.*

II. Kivu species.
  A. Jaws equal or lower feebly projecting.
    1. Teeth in 3 to 5 series, 40 to 60 in outer series of upper jaw (in specimens of 75 to 120 mm.); 7 to 9 gill-rakers on lower part of anterior arch.
Pectoral reaching vent, origin of anal, or a little beyond .... 6. *graueri.*
Pectoral reaching middle of anal .... 7. *adolphi-frederici.*

2. Teeth in 4 to 8 series, 40 to 70 in outer series of upper jaw (in specimens of 75 to 115 mm.); 9 to 11 gill-rakers on lower part of anterior arch .... 8. *astatodon.*
3. Teeth in 3 or 4 series, 36 in outer series of upper jaw (in specimens of 120 to 125 mm.) ...... 9. *paucidens.*

B. Lower jaw distinctly projecting .... 10. *vittatus.*

1. *Haplochromis schubotzi*, Bouleng., 1914.

Tilapia martini (part.), Bouleng. Cat. Afr. Fish. iii. p. 239.
Haplochromis schubotzi, Bouleng. *t. c.* p. 288, fig. 196.
Haplochromis angustifrons, Bouleng. *t. c.* p. 292, fig. 198.
Pelmatochromis spekii (part.), Bouleng. *t. c.* p. 416.

Depth of body 2⅗ to 2⅘ in the length, length of head 2⅘ to 3¼. Snout from shorter than to a little longer than diameter of eye, which is 2¾ to 3¾ in length of head, greater than præorbital depth, equal to or greater than depth of cheek; interorbital width 4 to 5 in length of head. Jaws equal or lower slightly projecting; maxillary about reaching vertical from anterior edge of eye; teeth conical or cuspidate, in 3 or 4 series, 36 to 60 in outer series of upper jaw. 3 or 4 series of scales on cheek. 7 to 9 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 31 to 33 scales in a longitudinal series, 5 to 7 from origin of dorsal to lateral line. Dorsal XIV–XVI 9–10; last spine ⅗ to ½ length of head. Anal III 8–9; third spine ⅓ to ⅖ head. Pectoral as long as or a little shorter than head, reaching anal. Caudal truncate. Caudal peduncle 1⅓ to 1⅗ as long as deep. Females silvery white; males often greyish, sometimes with indistinct cross-bars, usually with 2 bars across snout, 1 below eye, 1 on occiput, and 1 on nape, pelvic fins blackish, and ocelli on anal.

Lake Albert Edward.

Thirteen specimens, 70 to 135 mm. long.

2. *Haplochromis pappenheimi*, Bouleng., 1914.

Tilapia pappenheimi (part.), Bouleng. Cat. Afr. Fish. iii. p. 232, fig. 153.

Depth of body 3¼ to 3⅓ in the length, length of head 3⅙ to 3⅓. Snout as long as diameter of eye, which is 3⅓ in length of head, 1½ depth of præorbital, greater than depth of cheek, equal to interorbital width. Jaws equal or lower slightly projecting; maxillary not extending to below eye; teeth cuspidate, in 2 or 3 series, 46 in outer series of upper jaw. 3 or 4 series of scales on cheek. 9 to 11 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 33 scales in a longitudinal series, 6 or 7 from origin of dorsal to lateral line, 5 or 6 between pectoral and pelvic fins. Dorsal XV–XVI 9–10; last spine ⅖ length of head. Anal III 8–9; third spine ⅓ to ⅖ head. Pectoral nearly as long as head, reaching vent or anal fin. Caudal truncate. Caudal peduncle 1⅓ to 1¾ as long as deep. Silvery; dorsal greyish; caudal spotted.

Lake Albert Edward.

Four specimens, 80 to 90 mm. long.

3. *Haplochromis eduardii*, sp. n.

Tilapia pappenheimi (part.), Bouleng. Cat. Afr. Fish. iii. p. 232.

Depth of body 3 in the length, length of head 3. Snout shorter than diameter of eye, which is 3⅕ in length of head, twice depth of præorbital, greater than depth of cheek; interorbital width 4 in head. Jaws equal; maxillary extending to below anterior edge of eye; teeth cuspidate, in 3 series, 45 in outer series of upper jaw. 3 series of scales on cheek. 11 or 12 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 33 scales in a longitudinal series, 7 from origin of dorsal to lateral line, 8 between pectoral and pelvic fins. Dorsal XV 9; last spine nearly ½ length of head. Anal III 9; third spine ⅖ head. Pectoral nearly as long as head, reaching anal. Caudal truncate. Caudal peduncle 1⅓ as long as deep. Greyish, with bars across upper part of head and one below eye; two blackish blotches on basal part of spinous dorsal; pelvics blackish; ocelli on anal fin.

Lake Albert Edward.

A single specimen (♂), 80 mm. long.

4. *Haplochromis nigripinnis*, sp. n.

Tilapia pappenheimi (part.), Bouleng. Cat. Afr. Fish. iii. p. 232.

Depth of body 3⅓ in the length, length of head 3. Snout shorter than diameter of eye, which is 2¾ in the length of head, 2⅓ depth of præorbital, greater than depth of cheek; interorbital width 4⅓ in length of head. Jaws equal; maxillary extending to below anterior ¼ of eye; teeth cuspidate, in 2 series, 60 in outer series of upper jaw. 3 series of scales on cheek. 11 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 33 scales in a longitudinal series, 4 or 5 from origin of dorsal to lateral line, and the same number between pectoral and pelvic fins. Dorsal XVI 9; last spine nearly ⅓ length of head. Anal III 9; third spine as long as last dorsal. Pectoral a little shorter than head, reaching vent. Caudal truncate. Caudal peduncle 1½ as long as deep. Greyish; vertical and pelvic fins blackish, the dorsal pale at the base.

Lake Albert Edward.

A single specimen (♂), 80 mm. long.

5. *Haplochromis squamipinnis*, sp. n.

Pelmatochromis spekii (part.), Boulenger, Cat. Afr. Fish. iii. p. 417 (1915).

Depth of body nearly equal to length of head, 2⅘ in length of fish. Head 2¼ as long as broad; upper profile slightly concave. Snout 1½ diameter of eye, which is 4⅓ in length of head, greater than præorbital depth, less than depth of cheek; interorbital width 4⅔ in length of head. Maxillary extending to vertical from anterior margin of eye; lower jaw projecting; teeth conical, 4 series in upper jaw, 3 in lower, 60 in outer series of upper jaw. 5 series of scales on cheek; 10 gill-rakers on lower part of anterior arch; pharyngeal teeth slender. Dorsal XV 10; last spine longest, ⅓ length of head; longest soft rays ½ length of head. Anal III 9; third spine stronger and nearly as long as last dorsal. Series of small scales on basal part of posterior half of dorsal and anal, between the rays. Pectoral ⅘ length of head, reaching origin of anal. Caudal truncate. Caudal peduncle 1⅓ as long as deep. 33 scales in a longitudinal series, 7 from origin of dorsal to lateral line. Silvery; back darker; vertical fins dusky; caudal with some clear spots; anal with 2 ocelli posteriorly.

Lake Albert Edward.

One specimen, 170 mm. in total length.

6. *Haplochromis graueri*, Bouleng., 1914.

Tilapia burtoni (part.), Bouleng. Cat. Afr. Fish. iii. p. 217.
Haplochromis angustifrons, var. *gracilior*, Bouleng. *t. c.* p. 293.
Haplochromis graueri, Bouleng. *t. c.* p. 298, fig. 202.

Depth of body 2¾ to 3⅓ in length, length of head 2⅔ to 3. Snout from a little shorter to longer than diameter of eye, which is 3 to 4 in length of head, greater than depth of præorbital or cheek; interorbital width 4 to 4½ in length of head. Jaws equal or lower slightly projecting; maxillary extending to below anterior edge of eye or not quite so far; teeth cuspidate or conical, in 3 to 5 series, 40 to 60 in outer series of upper jaw. 3 or 4 series of scales on cheek. 7 to 9 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 32 to 33 scales in a longitudinal series, 5 or 6 from origin of dorsal to lateral line. Dorsal XIV–XVI 9–10;

last spine ⅓ to ½ length of head. Anal III 8; third spine ⅓ to ½ head. Pectoral nearly as long as head, reaching vent, origin of anal, or a little beyond. Caudal truncate. Caudal peduncle 1⅓ to 1⅔ as long as deep. Silvery or brownish; an opercular spot; soft dorsal and caudal sometimes spotted; males with a bar below eye, blackish pelvic fins, and ocelli on anal.

Lake Kivu.

Twelve specimens, 75 to 120 mm. long.

The caudal fin is broken into a rounded shape in the largest specimen.

7. *Haplochromis adolphi-frederici*, Bouleng., 1914.

Tilapia adolphi-frederici, Bouleng. Cat. Afr. Fish. iii. p. 220, fig. 143.

Apparently differs from *H. graueri* in the longer pectoral fin. The coloration is of the "*bicolor*" type, irregular black bars extending on to the vertical fins; but I have found in the Lake Victoria Cichlidæ that this occurs in individuals of several species.

8. *Haplochromis astatodon*, sp. n.

Tilapia burtoni (part.), Bouleng. Cat. Afr. Fish. iii. p. 217.

Depth of body 2½ to 3 in the length, length of head 3 to 3¼. Snout nearly as long as or a little longer than diameter of eye, which is 3⅓ to 3¾ in length of head, greater than præorbital depth, nearly equal to depth of cheek; interorbital width 3¼ to 3¾ in length of head. Jaws equal anteriorly or lower slightly projecting; maxillary extending to below anterior edge or anterior ¼ of eye; teeth cuspidate, in 4 to 8 series, 40 to 70 in outer series of upper jaw, the bicuspid teeth very variable in form, the cusps nearly equal in some specimens, in others the posterior cusp reduced and the anterior cusp long, oblique, and curved inwards, the teeth approaching the *Bayonia*, *Hemitilapia*, or *Schubotzia* types. 3 or 4 series of scales on cheek. 9 to 11 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 30 to 32 scales in a longitudinal series, 5 or 6 from origin of dorsal to lateral line. Dorsal XIV–XVI 8–9; last spine from less than ⅖ to ½ length of head. Anal III 8–9, third spine as long as or a little shorter than last dorsal. Pectoral a little shorter than head, not reaching anal. Caudal truncate. Caudal peduncle as long as or a little longer than deep. Body with or without cross-bars; an opercular spot and a bar below eye.

Lake Kivu.

Fifteen specimens, 75 to 115 mm. long.

9. *Haplochromis paucidens*, sp. n.

Tilapia burtoni (part.), Bouleng. Cat. Afr. Fish. iii. p. 217.

Depth of body 2⅗ to 2⅘ in the length, length of head 3⅓. Snout slightly longer than diameter of eye, which is 3⅔ in length of head, greater than præorbital depth, equal to depth of cheek; interorbital width 3½ to 3⅔ in length of head. Jaws equal anteriorly; maxillary extending to below anterior edge of eye; teeth in 3 or 4 series, 36 in outer series of upper jaw, the anterior conical and rather strong. 3 or 4 series of scales on cheek. 9 gill-rakers on lower part of anterior arch. Middle pharyngeal teeth slightly enlarged, subconical. 32 or 33 scales in a longitudinal series, 7 from origin of dorsal to lateral line. Dorsal XV 10; last spine nearly ½ length of head. Anal III 9; third spine ⅖ head. Pectoral ⅘ length of head, not reaching anal. Caudal truncate. Caudal peduncle 1½ as long as deep. Dark cross-bars on body; 2 bars across snout and 1 below eye; an opercular spot; soft dorsal and caudal spotted.

Lake Kivu.

Two specimens, 120 and 125 mm. long.

10. *Haplochromis vittatus*, Bouleng., 1901.

Paratilapia vittata, Bouleng. Cat. Afr. Fish. iii. p. 330, fig. 221.

Depth of body 3 to 3½ in length, length of head 2⅔ to 2⅘. Snout 1⅓ to 1⅔ diameter of eye, which is 4 to 4½ in length of head, greater than præorbital depth, about equal to depth of cheek; interorbital width 5 in length of head. Lower jaw projecting; maxillary extending to below anterior edge of eye; teeth conical, in 3 or 4 series, 40 to 60 in outer series of upper jaw. 3 to 5 series of scales on cheek. 8 to 11 gill-rakers on lower part of anterior arch. Pharyngeal teeth slender. 33 scales in a longitudinal series, 6 from origin of dorsal to lateral line. Dorsal XV–XVI 8–10; last spine ⅓ to ⅖ length of head. Anal III 8–9; third spine as long as or a little shorter than last dorsal. Pectoral ¾ length of head, reaching vent or origin of anal. Caudal truncate. Caudal peduncle 1⅓ to 1½ as long as deep. A dark lateral stripe and another above upper lateral line.

Lake Kivu.

Four specimens, 80 to 125 mm. long.

3. SCHUBOTZIA, Bouleng., 1914.

Scales ctenoid. A close-set series of enlarged teeth, with strongly incurved, flattened, rounded crowns, followed by 2 series of minute tricuspid teeth.

Lake Albert Edward.

Schubotzia eduardiana, Bouleng., 1914.

Schubotzia eduardiana, Bouleng. Cat. Afr. Fish. iii. p. 500, fig. 347.

Near *Haplochromis schubotzi*, differing especially in the dentition.

Total length 95 mm.

LXIX.—*On a new Genus of* Coccidæ *from the Indian Region*.

By E. E. GREEN, F.Z.S., F.E.S.

CRIBROLECANIUM, gen. nov. (subfamily *Lecaniinæ*).

Adult female with rudimentary limbs and antennæ. Spiracles communicating with the surface by means of a broad enclosed channel, the sides of which are studded with short glandular ducts. Dorsum with numerous, densely chitinous, perforated plates, arranged in more or less symmetrical series. Anal operculum surrounded by a densely chitinous area. Anal ring with ten or more setæ.

Nymph similar to adult, but with the limbs and antennæ still more rudimentary. Anal operculum not surrounded by a densely chitinous area.

Larva with fully developed limbs and antennæ. Dorsum with series of clustered pores in place of the cribriform plates.

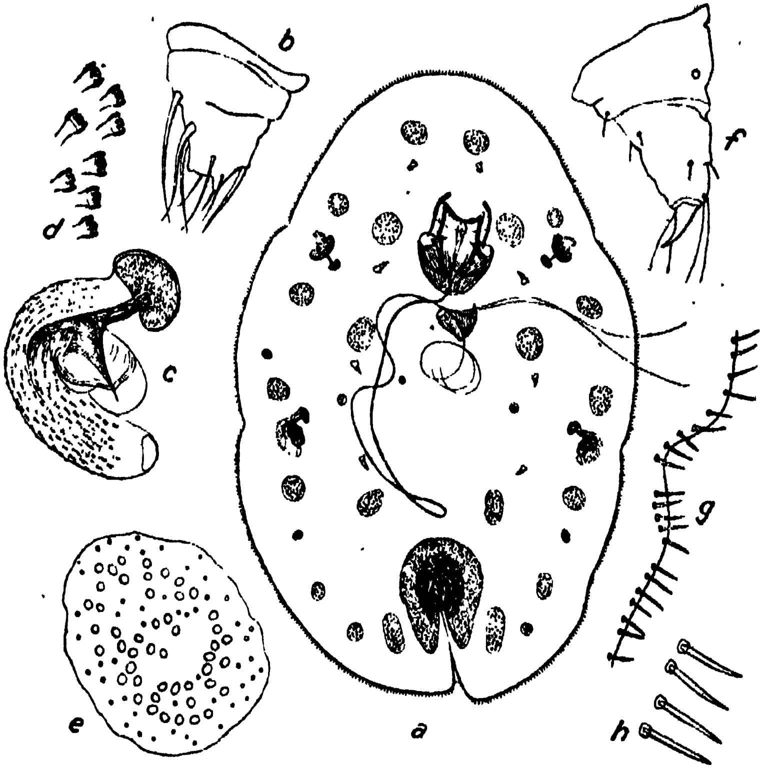
Male not observed in any stage.

Type, *formicarum*.

Cribrolecanium formicarum, sp. n. (Figs. 1 & 2.)

Fully matured adult female dark castaneous; subcircular, strongly convex, almost hemispherical; densely chitinous. At this stage of development the structural characters are obscured by the heavy chitinization, but the dorsum is seen to be studded with small translucent pores, interspersed with definite denser areas upon which the pores are more closely crowded. Other characters can be observed more clearly by an examination of the early adult insect. Diameter of fully developed insect 4 to 5 mm.

Fig. 1.

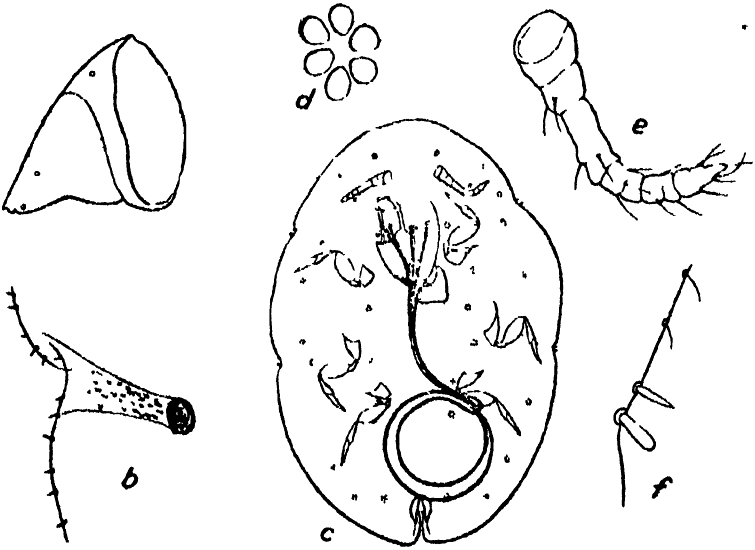


Cribrolecanium formicarum, sp. n.

a. Early adult female: opt. sect. × 30.
b. Antenna. × 450.
c. Posterior spiracle. × 130.
d. Pores surrounding spiracle. × 450.
e. Cribriform plate. × 220.
f. Anterior limb. × 450.
g. Part of margin. × 220.
h. Marginal spines. × 450.

Early adult female (fig. 1, *a*) pale purplish brown; broadly ovate, narrower in front. Derm (after treatment with boiling potash) soft and colourless, except on well-defined circumscribed areas. Antenna (fig. 1, *b*) rudimentary, without definite segmentation; some longish stout setæ on the apex and sides. Legs (fig. 1, *f*) minute and rudimentary, consisting of a broad basal segment, representing the combined coxa and femur, and a narrower tibio-tarsal segment surmounted by a well-developed claw; both ungual and tarsal

Fig. 2.



Cribrolecanium formicarum sp. n.

a. Anterior leg of nymph. × 450.
b. Posterior stigmatic area of nymph. × 130.
c. Larva: opt. sect × 50.
d. Larva: group of pores. × 450.
e. Larva: antenna. × 220.
f. Larva: stigmatic spines and marginal setæ. × 450.

digitules are present, the former slightly expanded at their distal extremities. Buccal apparatus large and conspicuous. Spiracular channels closely studded with tubular ducts of the form shown in fig. 1, *d*; the channel usually curved and opening on the venter at a considerable distance within the margin of the body. Dorsum with a subdorsal and sublateral series of densely chitinous, rounded, perforated plates (fig. 1, *e*), varying in size and form. Derm closely studded with minute pores, and with scattered, larger, thick-rimmed pores; also with scattered spiniform setæ. Valves of anal operculum together forming an oval, the base and outer edge of each valve describing an uninterrupted curve; the whole surrounded by a broad, densely chitinous zone, which is irregularly perforate around its inner margin. Anal ring with at least ten stout setæ. Stigmatic clefts shallow, without specialized stigmatic spines. Margin of body with a close fringe of strong spines (fig. 1, *g*, *h*), which are interrupted only at the stigmatic clefts.

Nymph very similar to the early adult insect, but distinguishable by the absence of a denser chitinous area surrounding the anal aperture. Antennæ and limbs still more rudimentary, the latter (fig. 2, *a*) being without definite claw or digitules. Cribriform plates as in the adult. Spiracular channels opening directly on to the margin at the stigmatic clefts (fig. 2, *b*). Marginal spines similar to and as large as those of the adult insect. No stigmatic spines. Anal ring with eight setæ.

Larva (fig. 2, *c*) with well-developed limbs and antennæ. The cribriform plates of the adult nymph are replaced by small groups of relatively large pores (fig. 2, *d*), interspersed with which are some isolated pores of a similar structure. Margin of body with simple, short, curved setæ. Stigmatic clefts with two stout spines (fig. 2, *f*), of which the anterior one is lanceolate and acuminate, while the posterior one is clavate and obtuse. Anal ring with six setæ.

Length 1 mm.

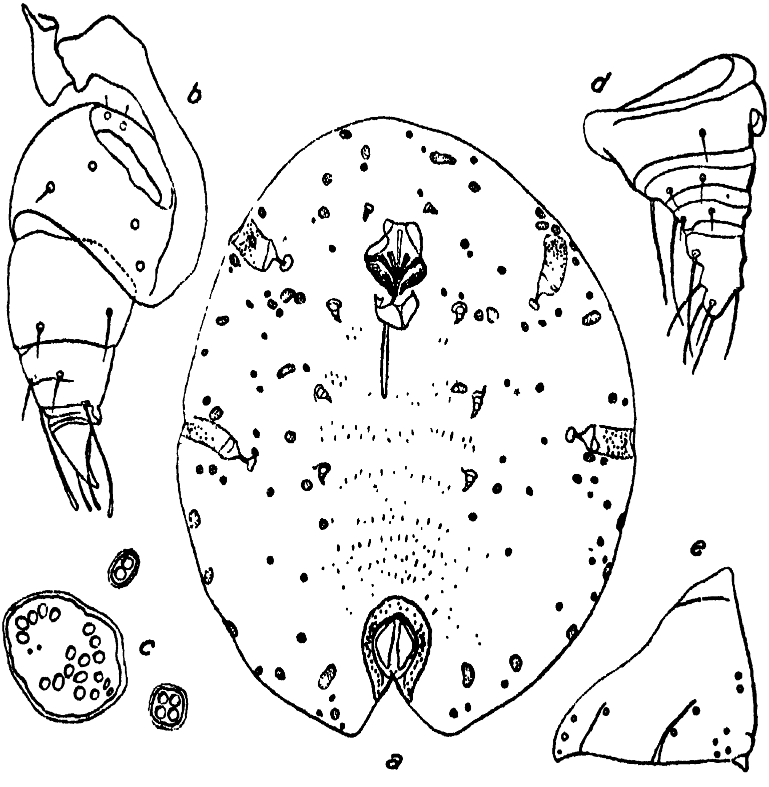
Peradeniya, Ceylon.

In hollow branches of *Stereospermum chelonioides*; associated with ants (*Cremastogaster* sp.). The branches had originally been tunnelled by some boring larva (probably of a Longicorn beetle), and had subsequently been occupied by the colony of ants.

Cribrolecanium radicicola, sp. n. (Fig. 3.)

Fully mature adult female, pale fulvous (dried examples); rather broadly ovoid (fig. 3, *a*), moderately convex, the medio-dorsal area raised sharply into a broad rounded carina; derm soft and wrinkled, not densely chitinous. Antenna (fig. 3, *d*) small and rudimentary, but distinctly 4- or 5-jointed, the joints separated from each other by broad bands of softer tissue, the narrow basal joint often incomplete. Legs (fig. 3, *b*) small and rudimentary, but relatively stout; coxa represented by an irregular narrow band, which is often

Fig. 3.



Cribrolecanium radicicola, sp. n.

a. Adult female. × 30.
b. Adult female: anterior leg. × 450.
c. Adult female: cribriform plates. × 220.
d. Adult female: antenna. × 450.
e. Nymph: anterior leg. × 450.

incomplete; femur, tibia, and tarsus all distinct, as broad as or broader than long; claw strongly developed, approximately equal in length to the tarsus; ungual and tarsal digitules slender, gradually dilated towards the extremity.

Spiracular channels broad, opening directly on to or close to the margin, closely studded with tubular ducts. Dorsum with irregularly disposed series of small, densely chitinous, cribriform plates (fig. 3, *c*) varying in size, form, and number of pores, but always much smaller and less conspicuous than those of *formicarum*, each plate with a narrow, sharply defined, paler outer border. Derm of dorsum with smaller and larger pores (the latter thick-rimmed) and with transverse series of spiniform setæ, which are larger and more numerous on the abdominal segments. Anal operculum surrounded by a densely chitinous zone, sprinkled with small pores and larger ovoid lacunæ. Anal ring with sixteen (or more) stout setæ. Margin of body without fringe of spines or setæ. Stigmatic clefts obscure, without stigmatic spines.

Length of average examples 2·5 mm.

Nymph very similar to the adult, but smaller and flatter, and without a denser chitinous area surrounding the anal aperture. Antenna 5-jointed, the basal joint in the form of a narrow band, second joint largest. Legs (fig. 3, *e*) reduced to conical points, with obscure traces of partial segmentation; with a minute apical claw. Cribriform plates as in adult, but often less strongly chitinized. Anal ring with ten setæ. Spiracular channels opening directly on to the margin. No stigmatic spines. No marginal spines or setæ.

Larva not observed.

Coimbatore, India.

On roots of *Cassia* sp. Coll. T. V. Ramakrishna (no. 204), 9. iii. 1921.

LXX.—*Some new or rare British Crustacea.*

By ROBERT GURNEY, M.A.

1. *Canthocamptus echinatus*, Mrazek.

In July 1919 a few specimens of a species of *Canthocamptus* resembling *C. echinatus* were taken at Flordon Common near Norwich, but I was unable at the time, with the scanty material available, to determine its identity with certainty, and I was unable to find the species again on a second visit to the spot. In 1920 the same form was found in considerable

Fig. 1.

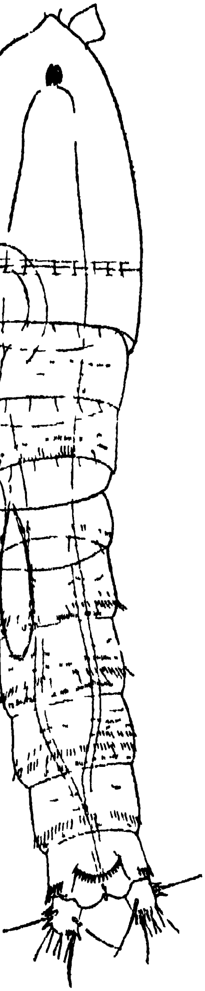
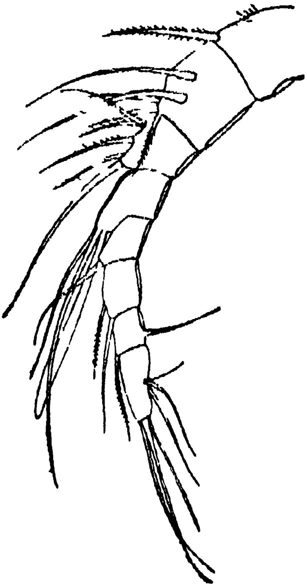


Fig 2.



Canthocamptus echinatus, Mrazek.

Fig. 1.—Male dorsal view, showing arrangement of cilia on cuticle.
Fig. 2.—First antenna of female.

number in *Sphagnum*-moss on Buxton Heath, and a careful comparison with Mrazek's description leaves no doubt that my provisional identification was correct. The specimens differ in some small details from Mrazek's description, and, as the species has not previously been found in Britain, some description and figures may prove useful to others.

The species was described by Mrazek in 1893 from specimens taken in Bohemia, and in 1894 Schmeil recorded the occurrence in Switzerland of a variety, which he named var. *luenensis*, differing from the type only in the possession of an additional seta on the basal joint of the fifth foot of the female. This var. *luenensis* has been found by others in Switzerland, in the Dauphiné Alps and at Lunz in Austria, but the typical form has not been met with again, neither has any description of the species been published other than that of Mrazek.

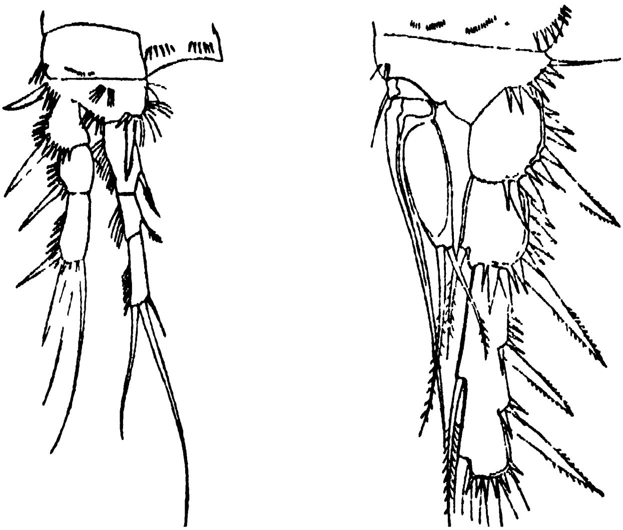


Fig. 3. Fig. 4.

Canthocamptus echinatus, Mrazek.

Fig. 3.—First leg of female.
Fig. 4.—Third leg of male.

The segments of the body are not toothed, but are characterized by the possession of numerous transverse groups of hairs or spinules on the dorsal surface of the two last thoracic and first three (or four in male) abdominal segments (fig. 1). Such dorsal rows of delicate hairs are also found in *C. crassus*, *C. pilosus*, and other species, but they are more conspicuous in *C. echinatus*, which owes its name to their presence.

Fig. 5.

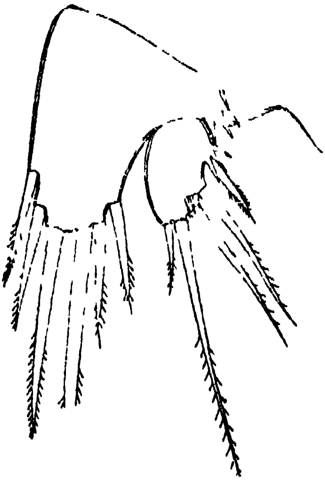
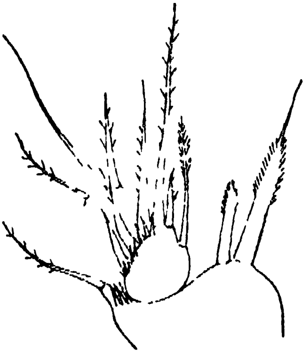


Fig. 6.



Canthocamptus echinatus, Mrazek.

Fig. 5.—Fifth leg of female
Fig. 6.—Fifth leg of male.

As regards the appendages, my own specimens agree with those of Mrazek, with the following exceptions:—

(1) First pair of legs: The agreement in general form is complete, but the first joint of the inner branch bears a short seta which is not shown in Mrazek's figure.

(2) Fifth leg of female: The basal joint bears six setæ instead of five, as is also the case in the var. *luenensis*. In other respects the agreement is close.

(3) Fifth foot of male: Here there is no difference in the number of setæ, but their relative length is not the same as that shown by Mrazek. The two strong spines of the basal

joint are somewhat variable, the outermost being sometimes scarcely more than half as long as the inner one, as figured by Mrazek, but usually it is about two-thirds of the length, as in var. *luenensis*. In the second joint the innermost seta is long and slender, as in var. *luenensis*, whereas Mrazek figures it as a minute spine.

I have met with this species in three localities in Norfolk—namely, Flordon Common near Norwich, Buxton Heath (Hevingham), and Holt Lowes. At Flordon it was found in calcareous mud from a pool, nearly dry, but in the other two places it was living in *Sphagnum*-moss, and it is probably to be regarded as a species preferring *Sphagnum* and water in which Desmids occur.

The resemblance between this form and *C. praegeri*, Scourfield, which Mr. Scourfield has recently described from a single female taken on Clare Island *, is very close, but the form of the furcal rami and the presence of hairs instead of spines on the anal operculum in *C. praegeri*, together with the divergence of the furcal setæ, sufficiently separate the two species.

2. *Canthocamptus weberi*, Kessler.

Kessler, Zool. Anz. xliv. 1914, p. 474; Thallwitz, Zool. Anz. xlviii. 1917, p. 159.

A few specimens of this rare species were found in July and August 1920 in pools on Newton St. Faith's Common near Norwich. There were at that time many small pools an inch or two deep with *Sphagnum* growing round the edges, and in most of them *Moraria brevipes*, Sars, was abundant, but *C. weberi* was only found in one or two of the pools in which the bottom was covered with a thin felt of the liverwort, *Gymnocolea inflata*. The few specimens observed were obtained by squeezing this liverwort. These pools occupy depressions in the heather-covered common, and are generally dry in summer. The summer of 1920 being particularly wet and cold the pools remained supplied with water throughout July and August, whereas in 1921 nearly all were entirely dry in May and *C. weberi* was not to be found.

C. weberi is an exceedingly small species, ·38 mm. long, and very closely resembles *C. typhlops*, Mrazek. It was described by Kessler in 1914 from specimens taken in moss in North

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* Proc. Roy. Irish Acad. xxx. 1912, p. 14.

Saxony, and, so far as I am aware, it has not been taken elsewhere.

The points of difference between *C. typhlops* and *C. weberi* have been very carefully described both by Kessler and Thallwitz, and the latter has gone fully into the relation between these two species and *C. zschokkei* and *C. pygmæus*, to which they seem to be related.

The most striking characteristic of the species is the form of the anal operculum, which bears three, or occasionally two, very large spines. These spines in *C. typhlops* are stated by Mrazek to be actually prolongations of the operculum itself, whereas in *C. weberi*, according to Kessler, they are spines set on the operculum in the usual way. Although my specimens belong unquestionably to *C. weberi*, I have not seen in any case any line of division between spines and operculum, and am therefore of opinion that this difference is more apparent than real. Thallwitz mentions that in one specimen of *C. typhlops* the outer spines appeared to be distinctly divided from the operculum.

I have compared my specimens with the descriptions of Kessler and Thallwitz, and find the agreement between them and the specimens from Saxony to be complete in every detail, with the exception of the opercular spines as mentioned above.

3. *Canthocamptus cuspidatus*, Schmeil.

Taken in *Sphagnum*-moss at Holt Lowes in Norfolk in June 1921, in company with *C. echinatus* and *Moraria brevipes*.

C. cuspidatus is a widely distributed species, but is characteristic of mountainous or northern regions. It has been found in various parts of Scotland, but not hitherto in any part of England, and its occurrence in Norfolk is therefore of rather special interest.

The locality in which it was found is a fold in the gravelly slope bounding the valley of Holt Lowes, at the head of which are springs the water from which trickles through beds of *Sphagnum* or supplies small shallow pools in the moss. The conditions are exceptional for this county, and approximate to those natural for the species. It is probably no more than a coincidence that the characteristically northern orchid *Goodyera repens* grows in the immediate neighbourhood of Holt Lowes.

4. *Leander longirostris* (Milne-Edwards).

Milne-Edwards, Hist. Nat. des Crustacés, ii. 1837, p. 392.

In some notes on the Crustacea of the East Norfolk rivers, published in 1907 *, I recorded the occurrence of *Leander squilla* in one of the Broads over 20 miles from the sea, and the same species has from time to time been taken since then at various points in these rivers, while it is known to be abundant at times in Breydon Water and in Oulton Broad. Having recently had occasion to re-examine my old specimens, and to compare them with a number recently taken from Breydon Water, it at once became evident that my original identification was not correct. The work of Stanley Kemp † and of De Man ‡ has now made the identification of the European species of Leander comparatively easy, and there can be no doubt that this Norfolk prawn is really *L. longirostris*, M.-Edw., a species which has not hitherto been recorded as British. It is common in the rivers Bure and Waveney, and probably also in the Yare, and prefers water of low salinity. It is known on Breydon as the "Jack Shrimp," and is regarded as a freshwater species, since it is most abundant when the water is least salt. It is not found in the sea nor anywhere on the coast of Norfolk, its place being taken in the salt-marshes from Hunstanton to Cley by *Leander squilla*.

I have been able to obtain most of the stages of the larval development both of *L. longirostris* and also of *L. squilla*, but there are certain points with regard to life-history and distribution which require further investigation and to deserve more detailed treatment on a later occasion.

EDITORIAL NOTE.

THE Editors desire to draw the attention of Contributors to the Recommendation of the British Association Committee on Zoological Bibliography and Publication that the ordinal (or class) position of a group treated in any paper should be clearly given in the title or in parentheses following the title. It is felt in many quarters that the value of papers appearing in these pages would be much increased if this course were more generally followed, and an appeal is therefore made to Authors to adopt the Recommendation.

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* Trans. Norf. & Nor. Nat. Soc. viii. p. 431.

† Fisheries, Ireland, Sci. Invest. 1908, i. 1910, p. 127.

‡ Tijdschr. Ned. Dierk. Vereen. xiv. 1915–16, p. 117.

INDEX TO VOL. VIII.

ABROCOMA, new species of, 216.
Achæa, new species of, 15.
Alexander, C. P., on new or little-known Tipulidæ, 161, 309, 546.
Amphineurus, new species of, 555.
Amphipoda, notes on, 116.
Andrews, C. W., on a Theropodous Dinosaur from the Lower Lias, 570.
Aphnæus, new species of, 598.
Arcypteræ, new, 369.
Asilinæ, new, 175.
Attatha, new species of, 18.
Aulacobothrus, new species of, 370.
Austen, E. E., on the prey of the yellow dung-fly, 118.
Azanus, new species of, 208.
Bactridothrips, new species of, 397.
Bagnall, R. S., on new Thysanoptera 393.
Batracharta, new species of, 28.
Berry, S., on a new Neotreme Brachiopod from California, 210; on some Japanese Cephalopods, 351.
Bibliographical notice, 147.
Blenina, new species of, 8.
Blosyris, new species of, 29.
Brachiopoda, new, 210.
Brevicosta, characters of the new genus, 234
Calolimnophila, characters of the new subgenus, 315.
Campion, H., on Odonata from New Caledonia, 33; on some dragonflies and their prey, 240.
Carea, new species of, 13.
Celantia. new species of, 542.
Cephalodiscus densus, on specimens of, 433.
Cephalopoda, notes on, 351.
Champion, G. C., on species of Laius from the Malayan Region, 193; on South-African species of Melyris, Fabr., 353; on the African species of Hedybius, Er., 449.
Chilton, C., on abnormal antennæ in the Crustacea Amphipoda, 116.
Chubb, C., on new forms of South-American birds, 444.
Coccidæ, new, 639.
Cockerell, T. D. A., descriptions and records of bees, 359; on fossil Arthropoda in the British Museum, 541.
Cœlacanth fish, on the, 320.
Coleoptera, new, 193, 149, notes on, 353.
Conepatus, new species of, 221.
Conilurus, new species of, 431.
Conosia, new species of, 315.
Crania, new species of, 210.
Cribrolecanium, characters of the new genus, 639.
Crustacea, new, 644.
Cryptotis, new species of, 354.
Ctenacroscelis, new species of, 111, 562.
Ctenomys, new species of, 218.
Culicidæ, new, 629.
Curculionidæ, new, 145.
Dicaiothrips, new species of, 309.
Dichætomyia, new species of, 421.
Dicranomyia, new species of, 161, 310, 546.
Diptera, new, 67, 99, 161, 225, 546, 576.
Dipterous larvæ, notes on, 601.
Dolichopeza, new species of, 170.
Drawida, new species of, 497.
Editorial note, 650.
Edwards, F. E., on Formosan Culicidæ, 629.
Edwards, F. W , on Eriocera in the British Museum, 67; on new and little-known Tipulidæ, 99.
Elæodes, new species of, 21.
Elaphrothrips, new species of, 398.
Elephantulus, new species of, 569.
Emmesina, characters of the new genus, 423.

Epinephele, new species of, 593.
Eremnus, new species of, 145.
Eriocera, new species of, 81, 319.
Euspilaria, characters of the new genus, 228.
Eutelia, new species of, 6.
Evotomys, new species of, 128.
Faureia, characters of the new genus, 389.
Freshwater sponge from New Zealand, note on a, 400.
Galea, new species of, 623.
Geological Society, proceedings of the, 143, 223.
Geranomyia, new species of, 101.
Gnophomyia, new species of, 556.
Gonomyia, new species of, 311, 557.
Green, E. E., on a new genus of Coccidæ, 639.
Grisonella, new species of, 213, 215.
Gronops, new species of, 150.
Gude, G. K., and Woodward, B. B., on their recent paper "On Helicella, Férussac," 624.
Gurnery R., on some new or rare British Crustacea, 611.
Gynoplistia, new species of, 560.
Halictus, new species of, 361.
Haplochromis, new species of, 635.
Hedybius, new species of, 457.
Helius, new species of, 103.
Heodes, new species of, 598.
Herpestes, new species of, 134.
Hesperomys, new species of, 623.
Heteroptera, new, 542.
Hinton, M. A. C., on a new bank-vole from Esthonia, 128; on the klipspringers of Rhodesia, Angola, and Northern Nigeria, 129.
Hulodes, new species of, 27.
Hydromys, new species of, 420.
Hylophilodes, new species of, 12.
Hymenoptera, new, 359, 514.
Hyposomus, new species of, 157.
Hypsimys, new species of, 613.
Hypsobia nosophora, on the anatomy of, 401.
Idiohelina, characters of the new genus, 238.
Idiopygus, characters of the new genus, 229.
Illops, new species of, 452.
Isosticta, new species of, 38.
Jaculus, new species of, 441.
Keilin, D., on the life-history of Dasyhelea obscura, Winnertz, 576; on some Dipterous larvæ, 601.
Kershaw, P. S., on some new mammals from East Africa, 563.
Kirkpatrick, R., on a freshwater sponge from New Zealand, 400; on Oculinaria australis, Gray, 494.
Lagidium, new species of, 219.
Laius, new species of, 195.
Lasiodora, on the genus, 337.
Lathy, P. I., on new species of Lycænidæ from Madagascar, 208.
Lecteria, new species of, 312.
Leporillus, new species of, 618.
Libnotes, new species of, 554.
Limnobia, new species of, 550.
Limnophila, new species of, 104, 318, 560.
Limnophora, new species of, 422.
Lithacodia, new species of, 6.
Lophoruza, new species of, 5.
Lowe, P. R., on a new willow-titmouse from Northern Italy, 443.
Lycæna, new species of, 597.
Lycænesthes, new species of, 208.
Lycænidæ, new, 208.
Lygæites, new species of, 512.
Maceda, new species of, 13.
M'Intosh, Prof., on notes from the Gatty Marine Laboratory, St. Andrews, 290.
Malloch, J. R., on exotic Muscaridæ, 225, 414.
Mammals, new, 128, 129, 134, 136, 139, 140, 212, 214, 221, 354, 357, 425, 440, 441, 442, 536, 563, 570, 608, 617, 618, 622, 627.
Marine Polychæta, recent additions to, 290.
Marshall, G. A. K., on new Curculionidæ from South Africa, 145.
Megachile, new species of, 364.
Megarhinus, new species of, 630.
Megathrips, new species of, 395.
Meliponorytes, new species of, 544.
Mello-Leitão, Dr., on the genus Lasiodora, C. Koch, 337.
Mereschkovsky, C., on diagnoses of some lichens, 246.
Metaphya, new species of, 64.
Microlarinus, new species of, 155.
Molophilus, new species of, 104.
Monodelphis, new species of, 441.
Muscaridæ, new, 225, 414.
Myiospila, new species of, 237.
Neotomys, new species of, 612.
Noctuidæ, new, 1.

Notodelphys, characters of the new genus, 137.
Notogrouops, characters of the new genus, 153.
Notomys, new species of, 537,
Nycticebus, new species of, 627.
Octomys, new species of, 217.
Odonata, new, 33.
Oligochæta, new, 496.
Oreotragus, new species of, 131.
Ormosia, new species of, 103.
Oryx, new species of, 209
Oryzomys, new species of, 356.
Oxymycterus, new species of, 615.
Pachycarus, characters of the new genus, 383.
Paguma, new species of, 617.
Papuaia, characters of the new genus, 422.
Paraechinus, new species of, 570.
Paralimnophila, characters of the new subgenus, 559.
Parallelia, new species of, 17.
Pararge, new species of, 592.
Pegomyia, new species of, 236, 421.
Phaonia, new species of, 235, 414.
Phascogale, new species of, 358.
Philhedonus, new species of, 189.
Philodicus, new species of, 179.
Phorenula, new species of, 377.
Phyllotis, new species of, 611.
Physothrips, new species of, 393.
Piranga, new species of, 446.
Pisces, new, 632.
Platyja, new species of, 27.
Plumulites, new species of, 125.
Plusia, new species of, 24.
Pœcile, new species of, 444.
Pogonomyia, new species of, 235.
Polybia, new species of, 545.
Polychæta, recent additions to marine, 290.
Problemacaris, characters of the new genus, 626.
Proechimys, new species of, 142.
Promachus, new species of, 175.
Promops, new species of, 139.
Prosopis, new species of, 363.
Prostethophyma, new species of, 375.
Prout, Miss A. E., on some Noctuidæ in the Joicey Collection, 1.
Psellіophora, new species of, 105.
Pseudochirus, new species of, 357.
Pseudolimnophila, new species of, 316.
Pseudomys, new species of, 621.
Pterocanthus, characters of the new genus, 418.
Pygophora, new species of, 239.
Rao, C. R. N., on the anatomy of some new species of Drawida, 496.
Rattus, new species of, 426, 568, 620.
Regan, C. T., on the Cichlid Fishes of Lakes Albert Edward and Kivu, 632.
Rhesalides, new species of, 31.
Rhopalocera, new, 590.
Ricardo, Miss G., on South-African and Oriental Asilinæ, 175.
Ridewood, W. G., on specimens of Cephalodiscus densus, 433.
Riley, N. D., on Rhopalocera from Mesopotamia and N.W. Persia, 590.
Risoba, new species of, 9.
Robson, G. C., on the anatomy and affinities of Hypsobia nosophora, 401.
Rothschild, Lord, on two new races of Oryx, 209.
Satin, new species of, 19.
Saltator, new species of, 445.
Sciurus, new species of, 609.
Scyllinæ, new, 369.
Serrodes, new species of, 30.
Spilaria, new species of, 227, 418.
Spilopteromyia, characters of the new genus, 422.
Stebbing, Rev. T. R. R., on a supposed new genus and species, 626.
Stictoptera, new species of, 7.
Strymon, new species of, 600.
Sturnella, new species of, 444.
Sylvilagus, new species of, 442.
Synthemis, new species of, 55.
Tateroma, new species of, 565.
Thomas, O., on the geographical races of Herpestes brachyurus, 134; on a new genus of opossum, 136; on a new bat from Peru, 139; on spiny rats from South-eastern Brazil, 140; on the "Huron" of the Argentine, 212; on mammals from San Juan, Western Argentina, 214; on two new Argentine forms of skunk, 221; on new Cryptotis, Thomasomys, and Oryzomys, 354; on a new Pseudochirus and Phascogale, 357; notes on Australasian rats, 425, on the jerboa of Muscat, 440; on a new short-tailed opossum from Brazil,

441; on a new cotton-tail from Colombia, 442; on the Australian jerboa-rats, 536; on a new hedgehog from the island of Djerba, Tunis, 570; on mammals from Jujuy, 608; on the masked civets of Western China, 617; on three new Australian rats, 618; on new Hesperomys and Galea from Bolivia, 622; on two new species of slow-loris, 627.
Thomasomys, new species of, 355.
Thysanoptera, new, 393.
Tipula, new species of, 106, 174.
Tipulidæ, new, 67, 99, 161, 309.
Trentepohlia, new species of, 165, 559.
Trupheopygus, characters of the new genus, 225.
Uvarov, B. P., on South-African grasshoppers, 369.
Watson, D. M. S., on the Cœlacanth fish, 320.
Withers, T. H., on the "Cirripede" Plumulites, 123.
Woodward, B. B., *see* Gude, G. K.
Xenotipula, characters of the new genus, 171.
Zale, new species of, 20.
Zegris, new species of, 591.
Zephyrus, new species of, 599.

END OF THE EIGHTH VOLUME.

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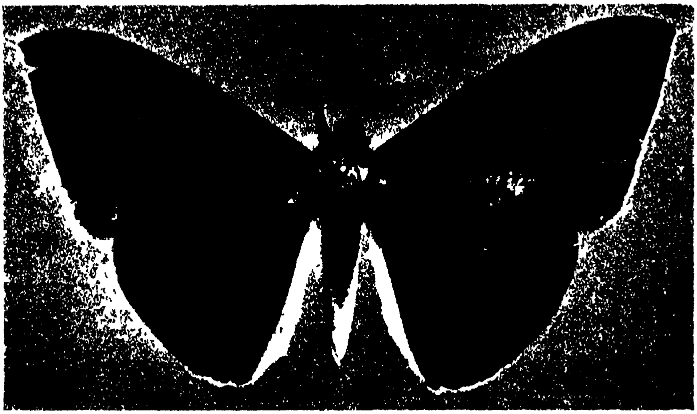

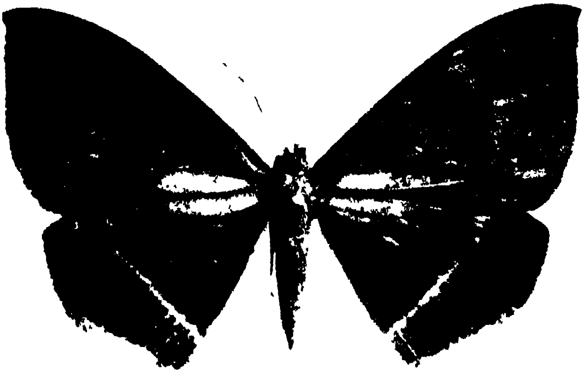

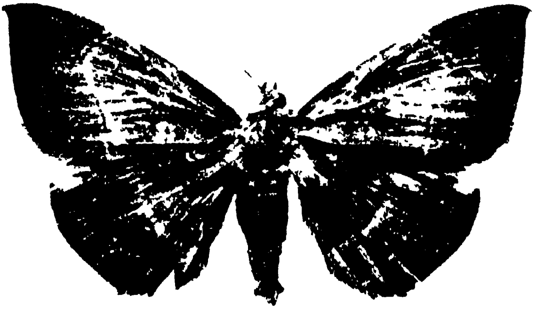

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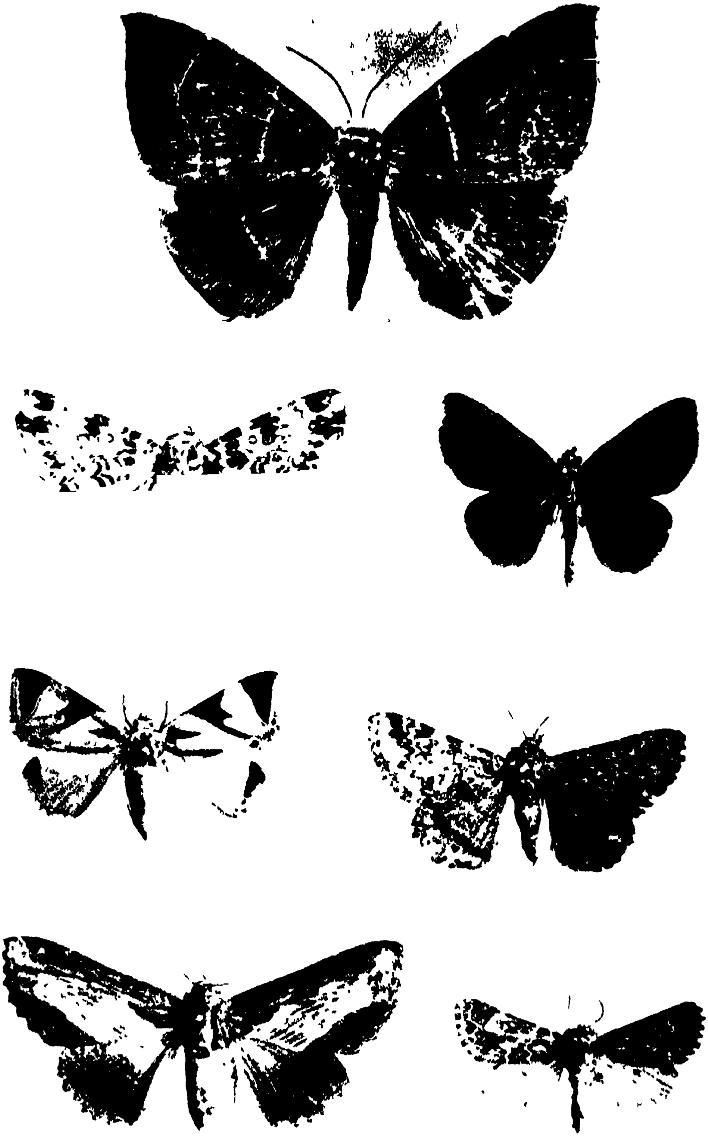

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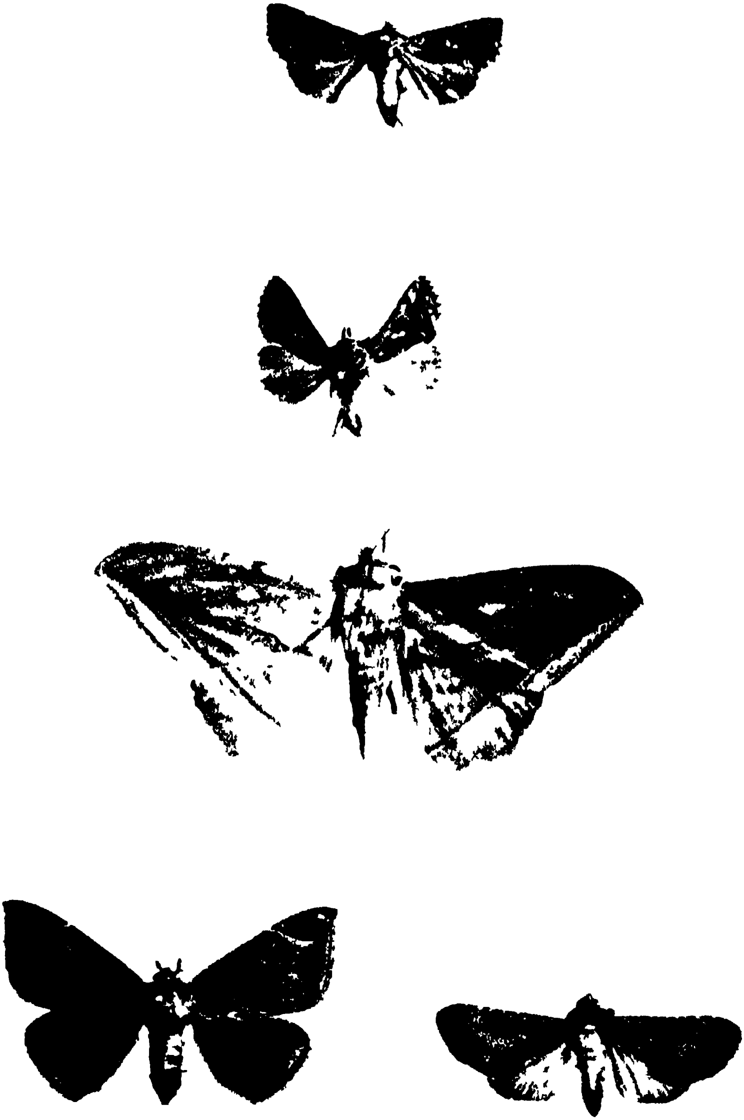

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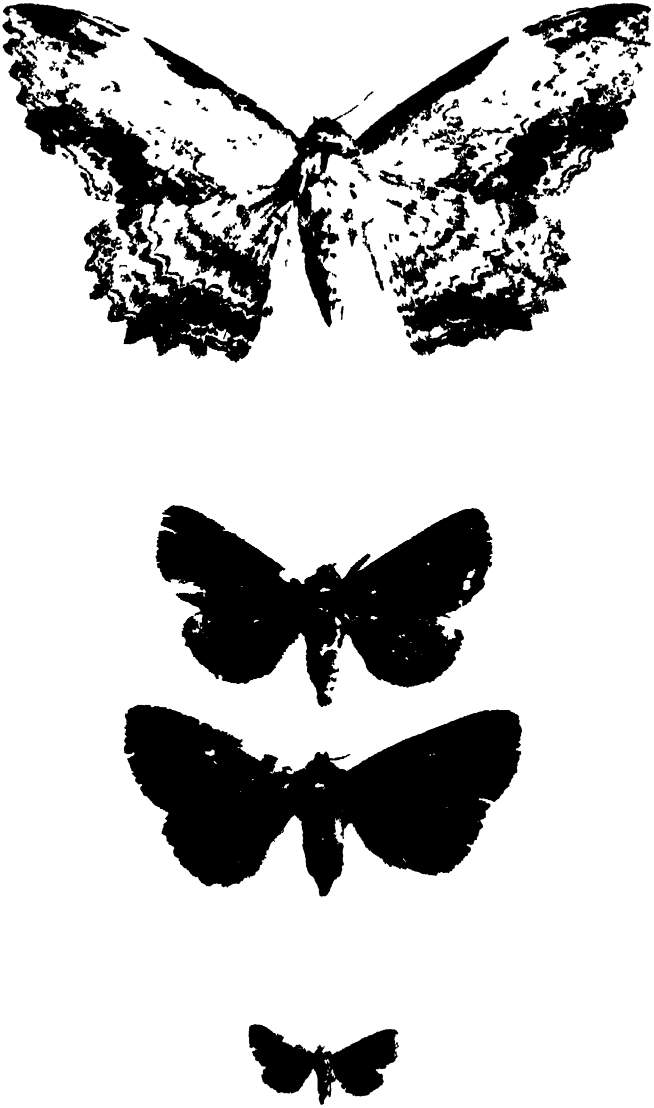

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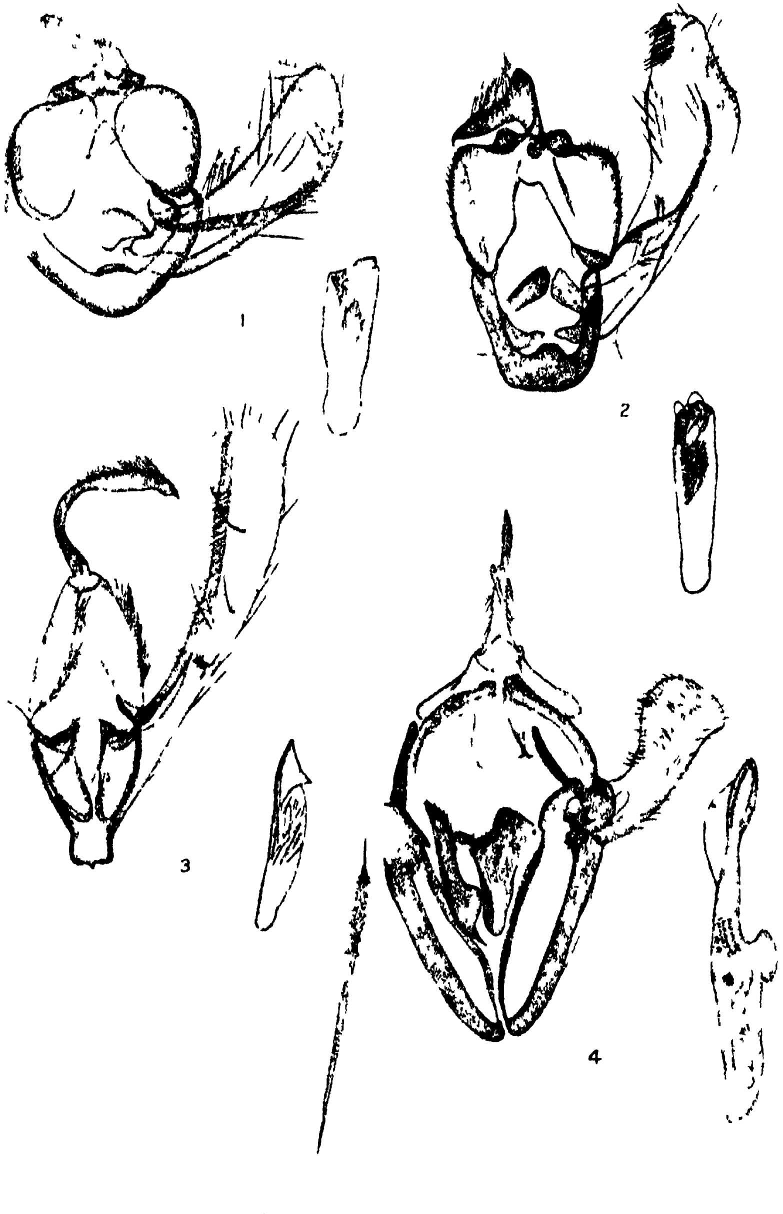
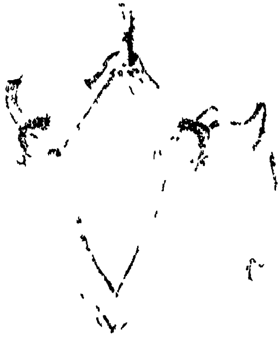
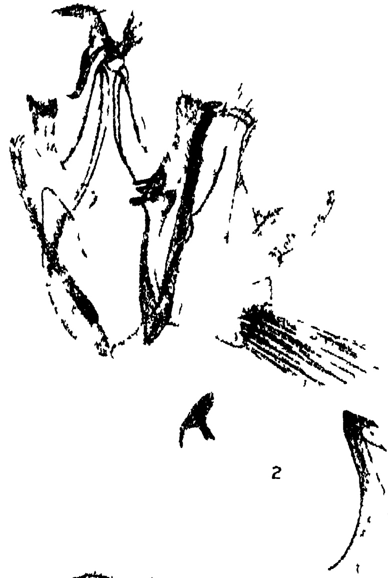


GENITALIA of NOCTUIDÆ.





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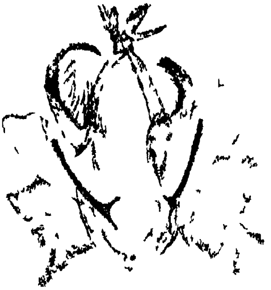

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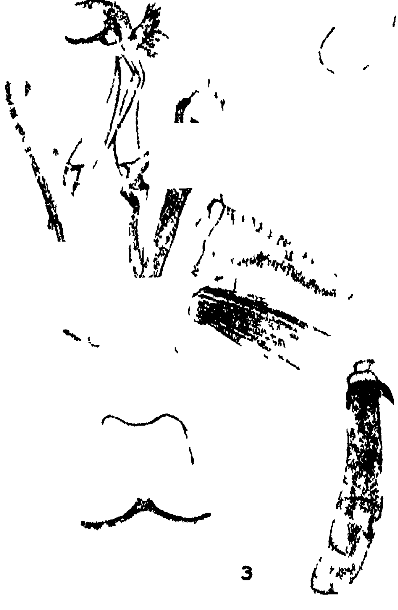

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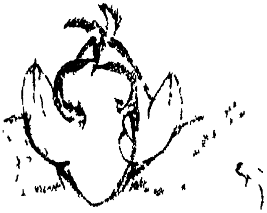

GENITALIA of NOCTUIDÆ

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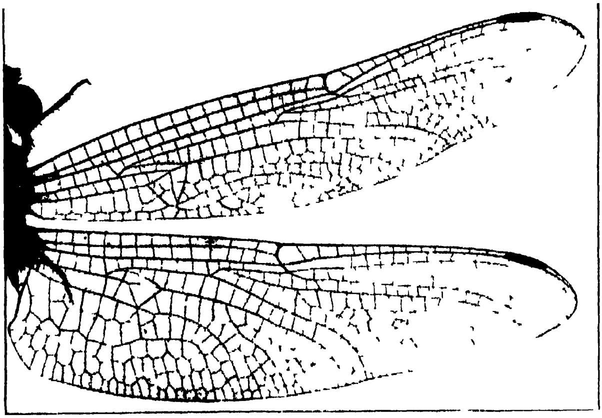

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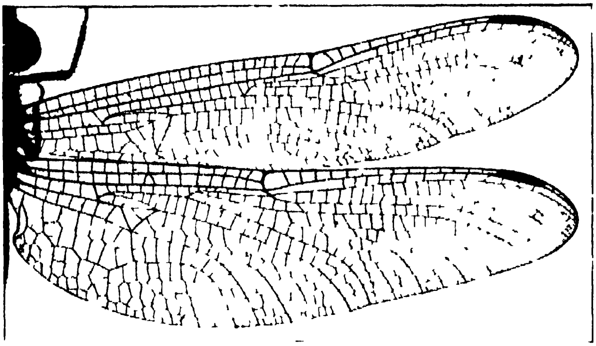

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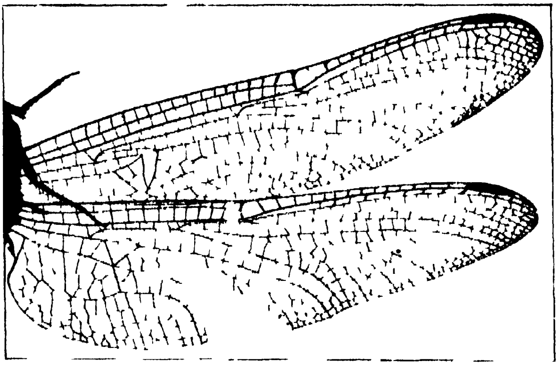

CORDULIINE DRAGONFLIES FROM NEW CALEDONIA

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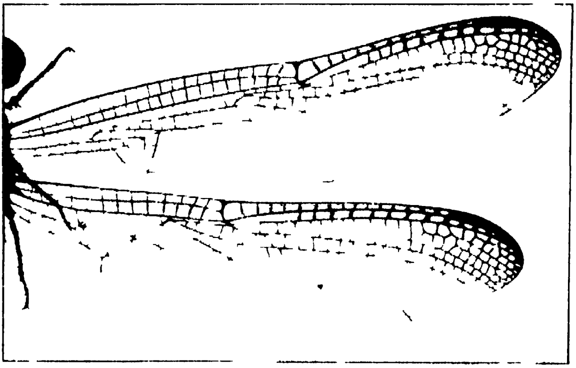
15



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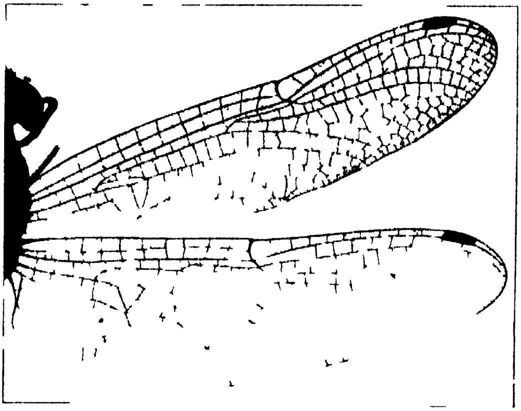

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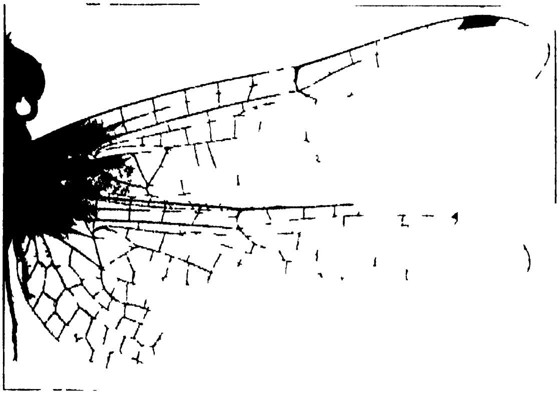

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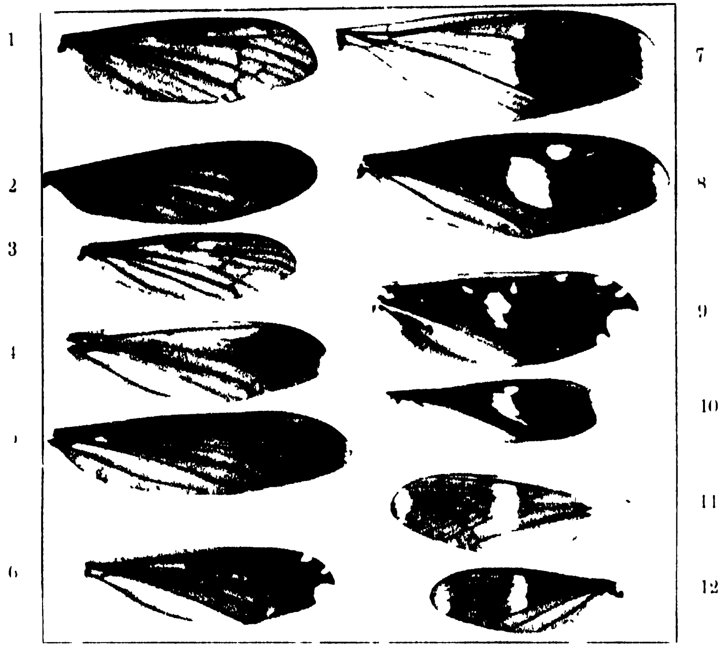
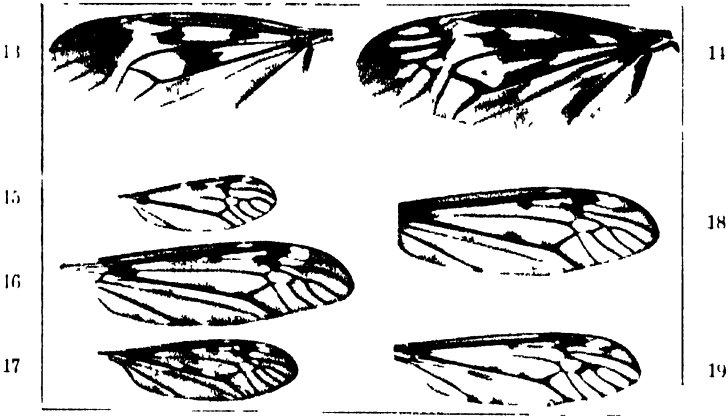


WINGS OF OLD WORLD SPECIES OF ERIOCERA.



WINGS OF FORMOSAN TIPULIDÆ.

BERRY. *Ann. & Mag. Nat. Hist. S. 9. Vol. VIII. Pl. XI.*

FIG 1

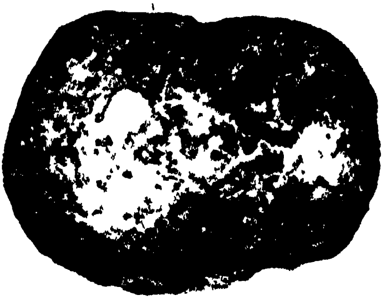
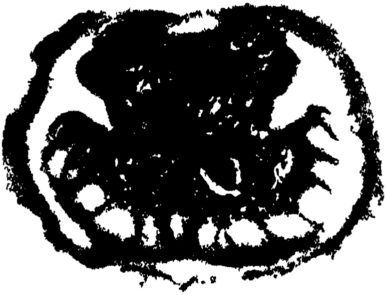
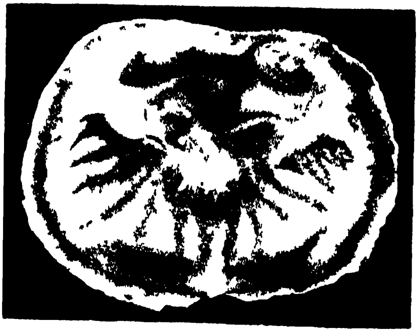
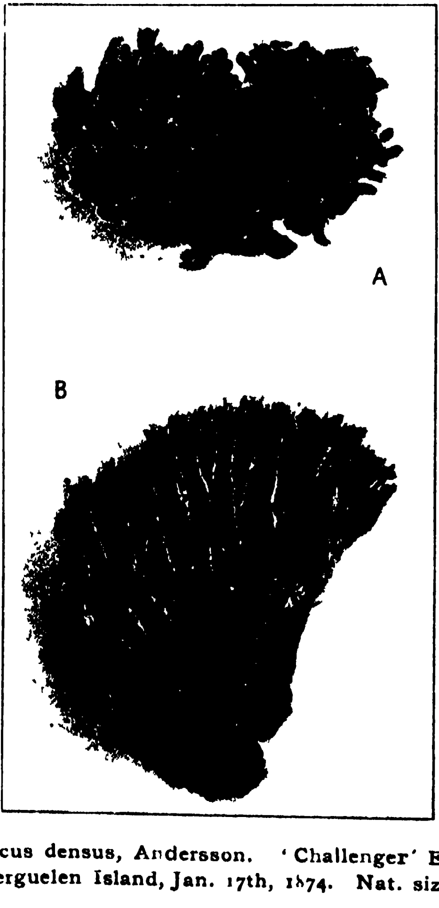


FIG 2





Crania californica, sp. n., from California.



Cephalodiscus densus, Andersson. 'Challenger' Expedition; Kerguelen Island, Jan. 17th, 1874. Nat. size.

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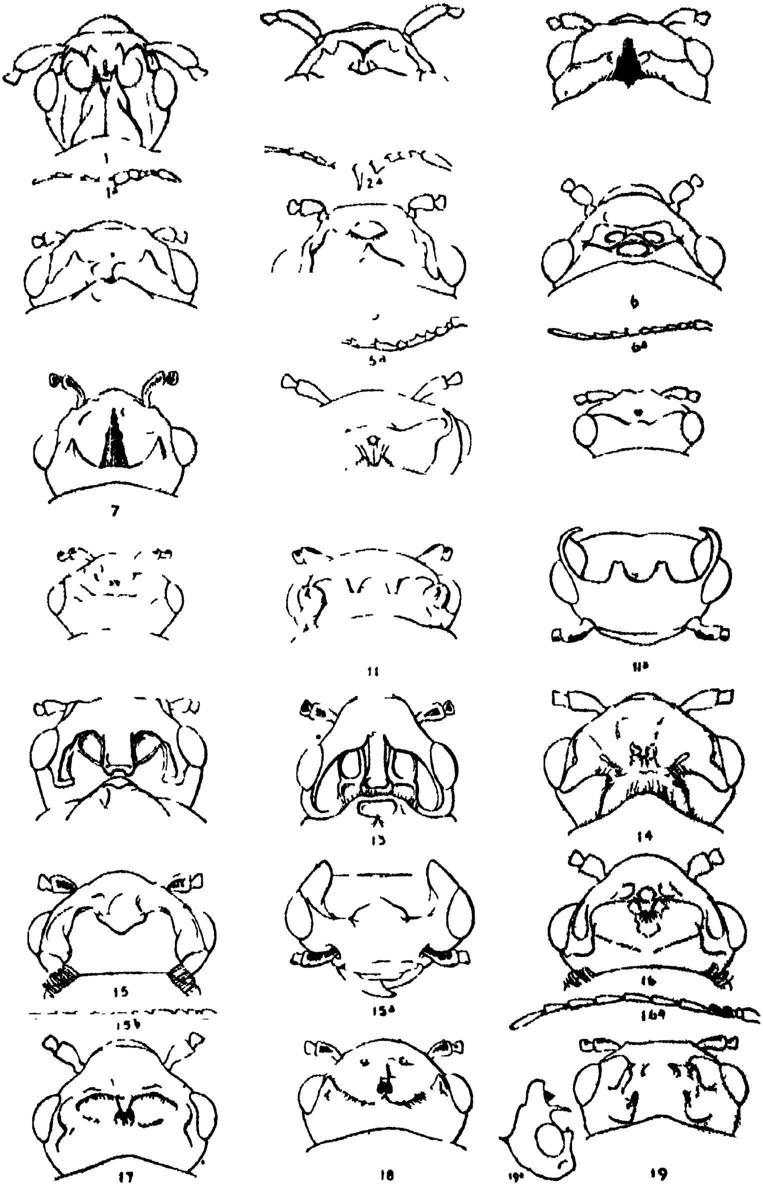
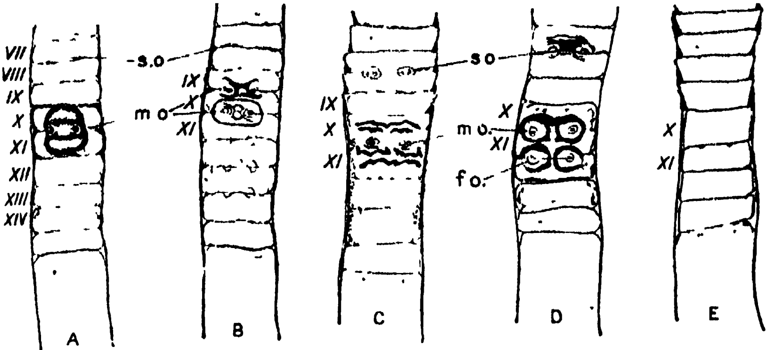


G F.T. del

AFRICAN SPECIES OF ILLOPS AND HEDYBIUS.



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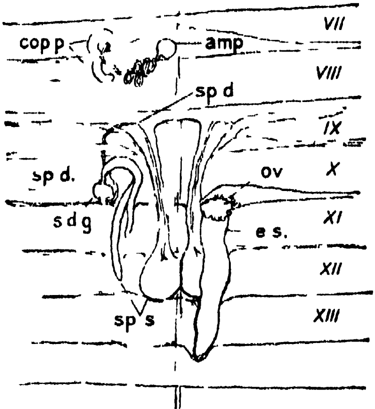

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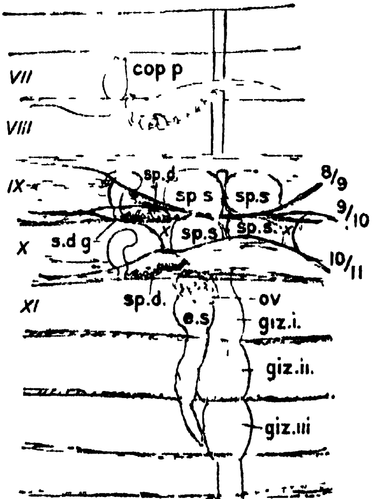

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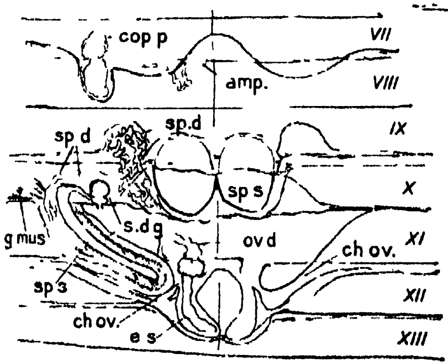

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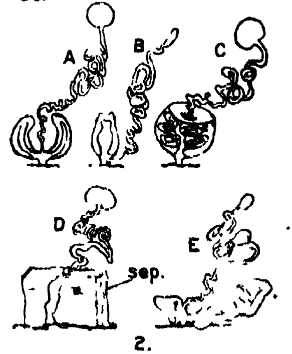

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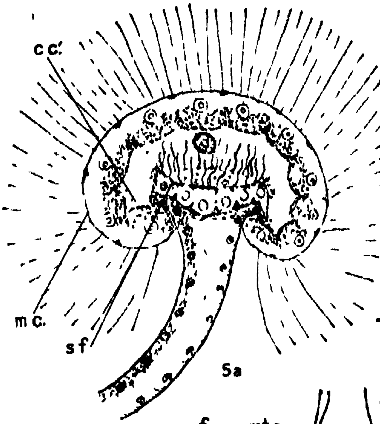

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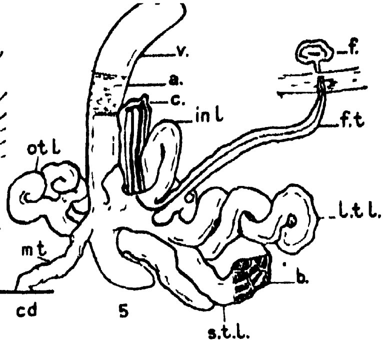

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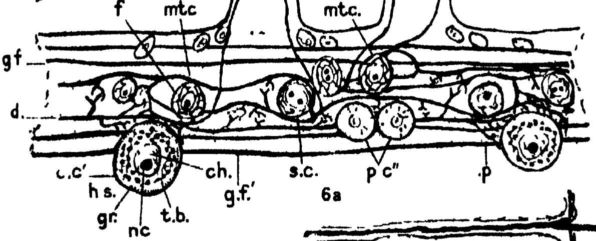

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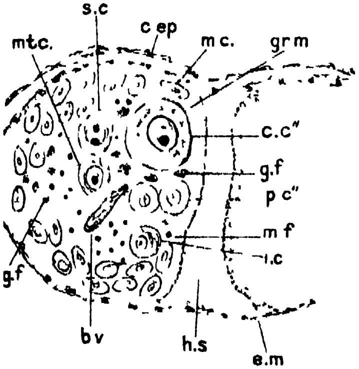

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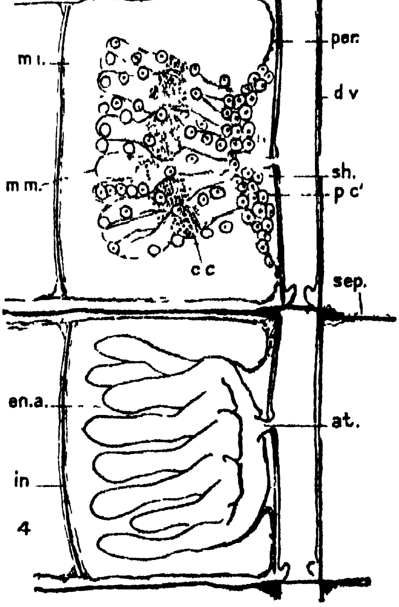

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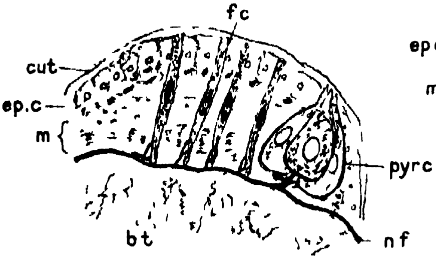

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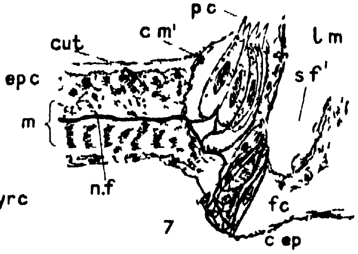

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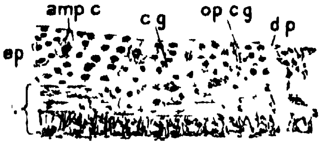

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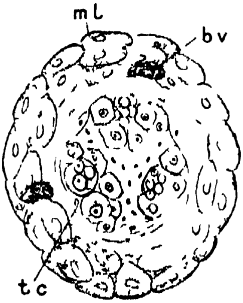

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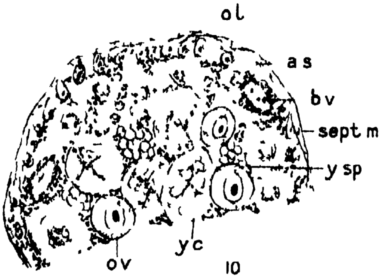

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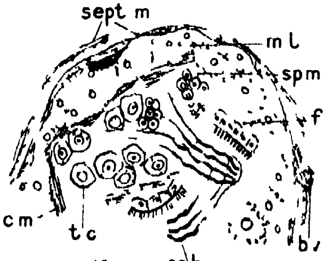

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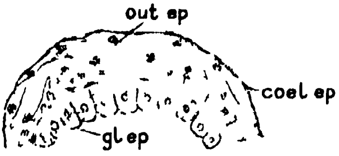

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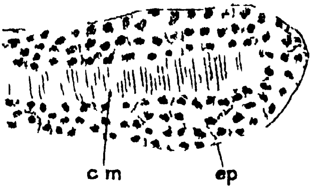

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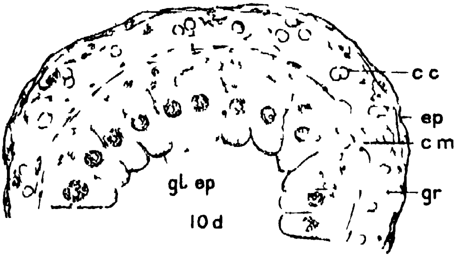

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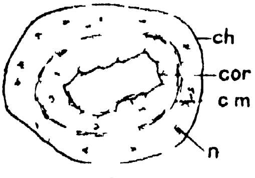

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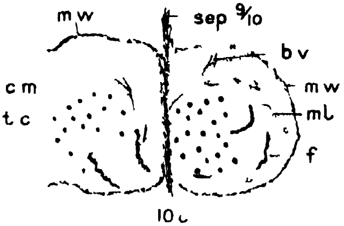

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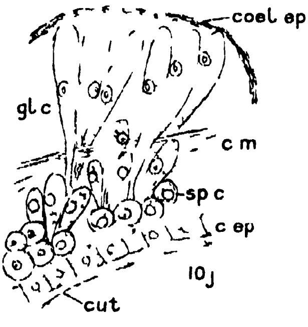

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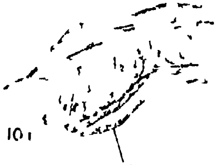

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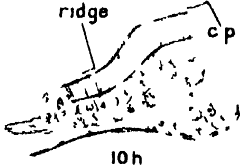

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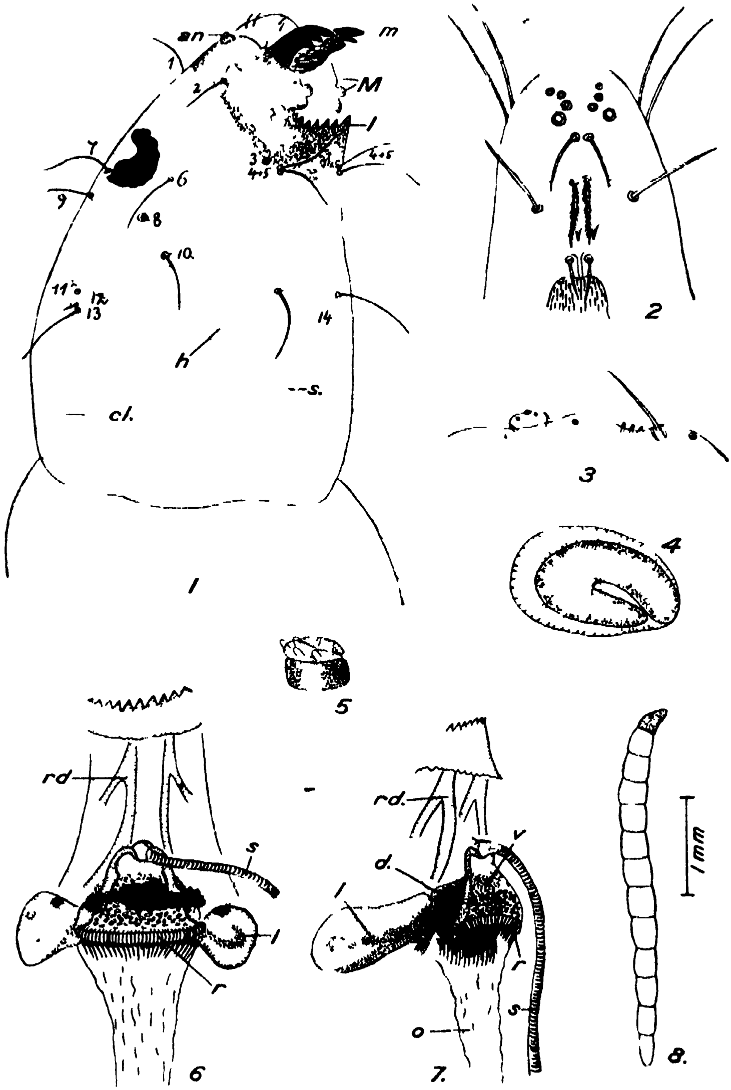

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Dasyhelea obscura, Winnertz.

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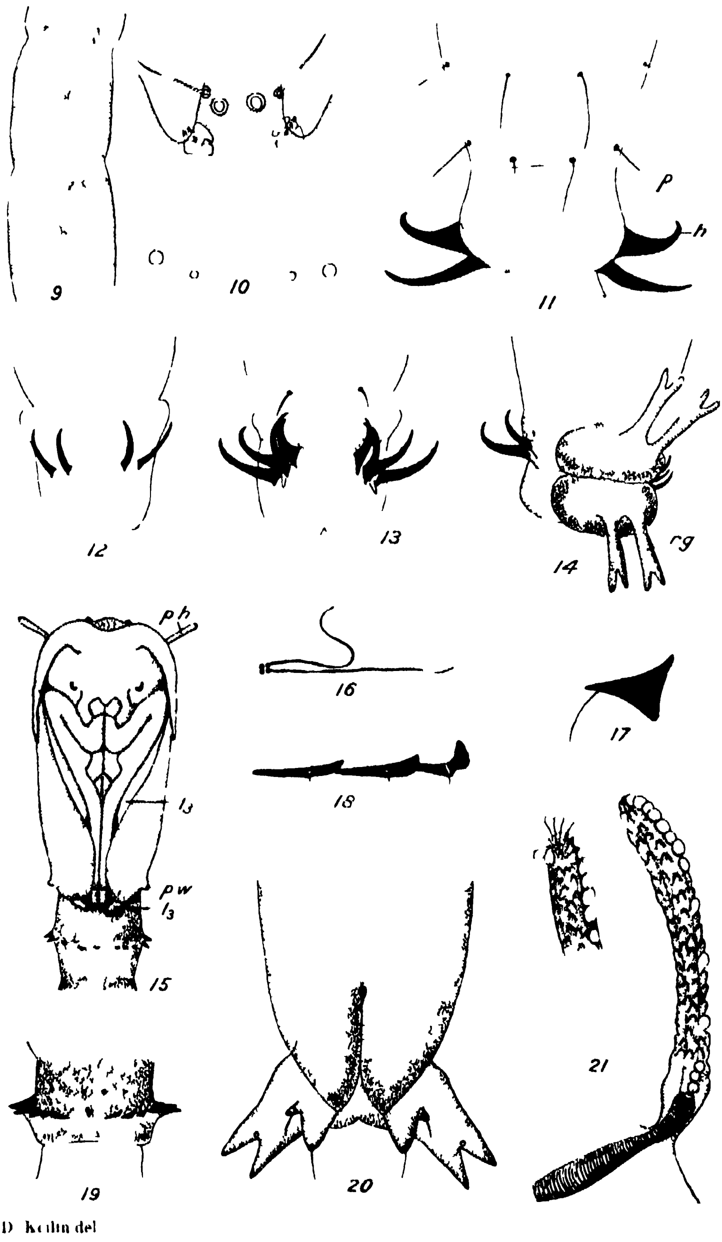

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